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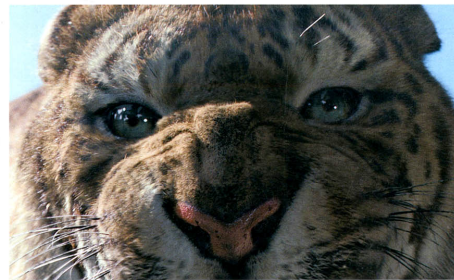
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Q&A

Greg & Colin Strause

Interview by Jody Duncan

The first time I met the Strause brothers they were working for a boutique visual effects firm housed in a *Pacific Palisades* apartment. At the time, both looked to be not too far out of high school. I recall hacked-off denim shorts, through which extruded the pale-as-skim-milk legs of young men who spend their days and nights at computer monitors. I recall empty pizza boxes strewn around the unkempt apartment. Despite the modest, frat-house surroundings and the youthfulness of the pair, I came away from that meeting impressed by Greg and Colin Strause. They were articulate. They were talented. They were ambitious. And through initiative and some luck, they had found themselves, not too long after coming to Los Angeles from their native Chicago, working on a handful of shots for what would become the biggest boxoffice champion film to date, James Cameron's *Titanic*.

Just 12 years later — after founding and running a successful visual effects company, Hydraulx, and directing a number of commercials and music videos — The Brothers Strause made their feature film directing debut with *Alien Vs. Predator: Requiem*, a Christmas 2007 release from Twentieth Century Fox. Sans pizza boxes and denim cut-offs, I talked to the brothers about their professional journey from the Santa Monica apartment to the *Big Time*, their transition from visual effects supervising to directing a major motion picture, and their plans for the future.

There's an amusing T-shirt slogan that says, '...but what I really want to do is direct.' There are a lot of people in the visual effects community who feel that way, but most never make that transition. Tell me how you segued from visual effects to directing.

GREG: It started with music videos around 2000, after we'd been in L.A. for about five years. Back in those days, the music video world was very much a guerrilla operation. It was like the Wild, Wild West, which made it more likely that someone would just hand you a camera, and say, 'Go over there and shoot some stuff!' And that's how it started. They'd have us shoot some elements. Then they started having us shoot stuff with the talent. It grew until, finally, a producer said, 'Why don't you guys go ahead and direct the whole music video?' And we were like, 'Uhhhhh, I don't know, are we ready to do that?' And four weeks later we got a call — 'I've got a music video job for you!' And we were like: 'Oh, shit. Okay, I guess we'd better be ready.'

COLIN: Our attitude at first was: 'Nah, we're too young. We'll think of directing in five or ten years.' But this producer kind of pressured us into it — 'No, no, do it now.'

What was the first music video that you directed?

COLIN: It was the music video for a song from a little movie Kirsten Dunst did before *Spider-Man*, so she hadn't really hit yet. The very first live-action setup we ever directed was Kirsten Dunst and a Ferrari. And they were like, 'Okay, you have her for one hour.' Her publicist was literally counting down every five minutes. "Forty-five minutes left ... Forty minutes left ... Thirty-five minutes left ...' No pressure there!

Had directing always been the ultimate goal for you guys? When you were kids, is that what you wanted to do with your lives?

GREG: Maybe Colin did more than me. I just thought the whole idea sounded insane. I mean, I wanted to be the quarterback for the Bears, too! That seemed about as realistic a thing to think about.

COLIN: But when we were little we used to make stop-motion movies with our Legos and a Super 8 film camera. I used to do practical visual effects with latex and armatures — but our mom couldn't stand the smell of the ammonia in the latex, and so she told us to start working on computers. Turned out to be pretty good advice.

How did you go from puttering at home to breaking into the visual effects industry professionally?

COLIN: We actually started doing corporate logos and stuff like that on an old Amiga while we were still in high school in Chicago. I would do the CG, and Greg would get us our jobs. He'd open up the phone book and cold-call video production companies that were listed in the yellow pages. So there we were in high school, getting these \$1000 and \$3000 jobs. To be 17 years old, working out of our basement, making that kind of money — holy crap!

GREG: That was in the pioneering days of CG, when people were just using basic things like the Video Toaster. A lot of techniques hadn't been invented yet, and so there weren't a lot of film schools teaching this stuff. There weren't a lot of books about it, either. Colin got started on the Amiga as early as 1988, 1989 — definitely the early days of CG.

COLIN: From the beginning, we wanted to work in movies, so we put together a demo reel of effects. We'd find cool visual effects from movies that we really liked — *The Mask*, *Terminator 2*, *The Abyss* — and try to re-create them.

How'd you do?

GREG: Well, they were good enough re-creations that when we sent out about a dozen of our demo reels to L.A., one guy called us. He said, 'You've got some interesting stuff on your reel — come on out.' And we got our first L.A. job, working on a feature, doing some compositing work. It was a John Landis movie called *The Stupids*, with Tom Arnold — and it was a really stupid movie, too. I did compositing work for that on a Flint workstation, which was a high-end, rare machine at the time.

How old were you guys at this point?

GREG: I was 20 and Colin was 18.

What job followed *The Stupids*?

GREG: After just two weeks of being in L.A., I met Mat Beck and Edson Williams, who were working on *The X-Files* television show. Colin started doing CG for *The X-Files* back in Chicago. This was 1995, and websites weren't common; and so he would FTP the CG stuff to me from Chicago to Los Angeles through terminals. Then I'd comp the stuff out here and deliver it — sometimes just hours before the show aired!

That work ultimately led to your branching out on your own and forming Hydraulx, your visual effects company; and that ultimately led to your directing music videos and commercials. How many commercials and music videos have you directed to this point?



*Having spent their high school years creating computer graphics for a range of businesses in their native Chicago, visual effects enthusiasts Colin and Greg Strause journeyed to Los Angeles soon afterward and landed postproduction work on James Cameron's *Titanic* and on *The X-Files* television series. Over the next dozen years, the Strause brothers founded their own visual effects company, Hydraulx – which generated shots for many of the biggest effects films of the past decade – and began directing music videos and commercial spots. Colin and Greg Strause review footage on a video playback unit.*



*Critical notice of the Strauses' music videos and commercials led to a shot at directing a full-length feature film, *Alien Vs. Predator: Requiem*. The science-fiction horror film – a direct sequel to Paul W.S. Anderson's *Alien Vs. Predator* and cinematic spawn of the original *Alien* and *Predator* films – centers on the inhabitants of a small Colorado town overrun by predators and aliens, intent upon killing both humans and each other, that have crash-landed on earth.*

GREG: Probably about a dozen of each. Around 25 or 30 jobs.

And you fit those directing jobs in between running Hydraulx?

COLIN: We work seven days a week.

Professionally, there is still quite a chasm between directing music videos and commercials and directing a major feature film. Tell me how you made that leap and came to direct *Alien Vs. Predator 2*.

GREG: The key career turn was the third music video that we directed, which was for a band called 'Linkin Park.' They were a little unknown band, and the video we did for them, *Crawling*, wound up getting nominated for best director at the MTV awards. That led us to getting feature film representation at

William Morris Agency. We'd been there for a little while, and then our agent asked us if there was any project that we were interested in doing. And we said, 'Yeah, there's this movie called *Alien Vs. Predator* that's out there, based on a comic book.' This was before the first movie got made. We got the script, came up with our own idea for the movie, and then went in and pitched it to the studio. They didn't bite, though?

GREG: No. The problem was that our vision for the movie was a crazy \$150-million space epic, and the studio wanted to do something more in the \$50- to \$60-million range. Paul Anderson ended up doing it, and it did very well at the boxoffice and on DVD. In the meantime, we kept building our reel. We'd done some short films, and we'd done the effects for some big Fox movies. So the people over at Fox started becoming more familiar with us. We did effects for *The Day After Tomorrow* and won the BAFTA for that. Then we did effects for *Fantastic Four* and *X-Men 3* — and it was during *X-Men 3* that we got the script for *AVP2*. We came up with a bunch of ideas for it, and went in and did a presentation at Fox; and at that point all the stars aligned. They had come to trust us and like us for our effects knowledge and style, and we had a lot of cool ideas for the movie. So everything came together, and they said, 'Let's go for it.'

What were some of the ideas you brought to the *AVP2* script?

COLIN: Well, for one thing, in the script we first saw, the pred-alien creature died on Page 2, in the first minute of the film! And we were like, 'Nooo!' People would have thrown tomatoes at the screen if we'd done that. Here was this cool new creature, something that had been hinted at in the last movie, and you kill it off right away? We thought it was definitely something that had to be paid off. We'd seen aliens in five movies at this point, and predators in three films. We'd seen the alien queen in quite a few movies. We thought that the audience was ready to see something new.



Within a spaceship bound for the predator home world, a fallen predator lies in state on a cryogenic bed. The predator and cryogenic unit were shot against greenscreen. Hydraulx, which realized all the show's major effects shots, nestled that greenscreen element into a CG ship interior set and tracked a CG earth and starfield into the background. Hydraulx artists completed 460 visual effects shots for the production.

GREG: Also, we felt that over the last few movies the franchise had moved away from what had made them successful in the first place — the fact that they had been so dark and scary and gritty. Both *Alien* and *Aliens* were really horrifying films. *Aliens* scared the piss out of us when we were kids! But as the franchise went on, the movies drifted away from that tense, scary quality — and we wanted to bring that back with this movie. We wanted an ‘R’ rating. We wanted to go hardcore — and we did. There is some bad stuff in this movie.

Once you got into directing the movie, did you find that your music video and commercial spot directing experience was valuable? Or was directing a feature film a completely different animal?

COLIN: The main difference had to do with endurance. The longest commercial shoot, probably ever, would be like two or three weeks. The longest we’d ever done in our career was a one-week shoot. Usually, they are two or three days. So we went from a directing job that typically lasted two or three days to one that lasted 52 days. With tests and everything, we had 11 straight weeks of shooting.

GREG: And that was pretty short for a movie. That added more pressure on us, because we had to move on this shoot. We had 42 company moves in 52 days. Sometimes we’d spend the morning shooting an entire dialogue scene; and then we’d pack everything up, go to the next place, and shoot the next thing. Because of the limited time, we had to make quick decisions about what was really necessary and what wasn’t. If we didn’t need a second angle on something, we didn’t do it.

Through your visual effects work, you guys have obviously developed an eye for dynamic action sequences, for building suspense, for dealing with creatures and that sort of thing — but what about directing actors in dialogue scenes? Was there any insecurity about doing that?

GREG: We’d be lying if we said there wasn’t any concern about that, just because we hadn’t done a lot of dialogue stuff prior to this movie. But Colin and I are picky guys, and we’re big fans of cinema; and so we had a pretty good grasp of performance level and intensity. If you watch thousands of movies, as we have, you get a sense for it.



A hybrid predalien – part-predator, part-alien – bursts from the dead warrior’s chest and eventually kills the spacecraft crewmembers, leading to the ship’s crashing on earth. A man and his son witness the fiery crash while out deer hunting. Hydraulx digitally enhanced the live-action plate, replacing the sky with a more dramatic matte-painted sky and adding a volumetric contrail created through a combination of dynamic fluid and particle simulations.

Having a sense for performance isn't the same as directing an actor's performance, though.

GREG: No, it doesn't make up for never having actually done it. Blocking scenes out, especially, was a real learning experience. You can't just have the actors standing there. You want the scene to be more interesting than that. If you look at how the masters like Spielberg do it, they always have fantastic blocking in their scenes. That was something we had to learn to do.

COLIN: It went slowly at the beginning, and gradually we got the hang of it. The second week was better than the first; and the third week was better than the second. By halfway through the shoot, we were sailing.

What kind of look, overall, did you want for the film?

GREG: We wanted it to be very cinematic, dark and contrasty. Daniel Pearl was our cinematographer, and we chose him because he shot *The Texas Chainsaw Massacre*, which was a tonal reference for us when we went in to pitch *AVP2* to the studio. We said we wanted to do *Texas Chainsaw Massacre* with aliens and predators running around. That was our philosophical statement, at its most simple and basic.

As visual effects supervisors, you guys have worked with a lot of directors. Is there a particular director you've learned from the most?

COLIN / GREG (simultaneously): Cameron.

COLIN: Jim Cameron would be #1. We worked with him on *Titanic*. We weren't on set for that, but we used to drive up to his house with Mat Beck to look at stuff. Watching him in post was amazing, just seeing how incredibly sharp his eye is.

I thought I detected some 'Cameron blue' lighting when I first saw the *AVP2* trailer.

GREG: That was intentional. Again, because we thought the last couple of movies in the *Alien* franchise had moved away from the roots, we wanted to tie *AVP2* back to the earlier films, visually.



Alien Vs. Predator: Requiem marks the sixth film outing for the biomechanoid aliens – designed for the first film by H.R. Giger – and the fourth appearance of the dreadlocked predators. Constrained by a limited visual effects budget, the Strause brothers relied heavily on live suited performers for the title creatures in their film – as had the filmmakers who crafted the previous entries in both franchises. Actor Ian Whyte, who portrayed the lead predator in *Alien Vs. Predator*, reprised the role in a suit fabricated by creature effects artists at Amalgamated Dynamics Incorporated. A.I. founders Tom Woodruff Jr. and Alec Gillis have been associated with the Predator

If you watch *Alien* and *Aliens*, those two movies hold together beautifully. On *Alien*, they started experimenting with different color palettes, and it was a whole different kind of movie. Then, *Resurrection* went in an even more weird direction.

franchise since its inception, and with the Alien franchise since Aliens. After playing the lead alien in three previous films, Woodruff – an acclaimed suit performer with many creature credits – re-created the lead alien role for Alien Vs. Predator: Requiem, and also portrayed the new predalien.

Our idea was to get the franchise back on the right path and to bring back elements that would feel familiar to the audience. That blue color was a dominant element, even in the first *Alien*. When they are inside the derelict ship, looking around — that was all that same type of blue. We used that same palette so that, subconsciously, when people were watching *AVP2*, it would feel familiar to them, as if it was in the same family as the first two movies.

What, specifically, did you pick up from Cameron when you watched him doing post work for *Titanic*?

COLIN: He has the best and most consistent eye for feedback ever. The guy would see something, even looking at it on a really crappy monitor, and he could tell you exactly what was wrong with it and what you needed to do to it. Some directors get very flip-floppy, and you wind up going in circles. Cameron's not like that at all.

GREG: He knew exactly what he wanted ahead of time. It wasn't like, 'Show me three versions of something and I'll pick one.'

Colin: 'And then I'll have a whole new set of notes on that!'

GREG: Because he had that vision in his head, from the beginning, if what you gave him wasn't right, he knew it immediately. He was always able to give you very clear, precise directions.

COLIN: But he never wanted to give those directions twice. Once he'd told you, you'd better get it, or there would be yelling. And that was an interesting lesson we learned from him, too. As a director, everyone is supposed to be working for you; but at the end of the day, some people aren't as committed to the movie as you are. And it gets very frustrating when you feel as if people aren't giving you everything they could. The way Cameron dealt with that was to instill fear in people's hearts.

GREG: You'd hear people say, 'Oh, he's such a dick.' But the thing was, every single minute of his day he was hearing excuses from people as to why they didn't want to do what he wanted. So creating a level of fear around you isn't such a bad idea, because then people tend not to give you that kind of excuse shit. Everyone knows that if they don't do it and do it right, there's going to be hell to pay. Either you are 100-percent committed to the project or you're not. It's like being in a battle in a war — if you try to desert, they shoot you. Same thing with Cameron.

You guys seem pretty jovial and nice — were you able to 'instill fear in people's hearts' on this project?

GREG: I wouldn't say that; but if something was really substandard, we let our feelings be known. The atmosphere on set was generally pretty positive. Tell me about co-directing a movie. How did that work, logistically?

GREG: The most important thing was to have one shared vision for the movie.



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Was that hard to come to?

GREG: It depended. On some things we saw 100-percent eye-to-eye; on other things, we had different ideas. But that was all figured out by the time we got on set. It had to be.

So all the knockdown, drag-out fights were happening off the set.

GREG: That's right. They gave us a nice trailer for that. (laughs) The risk of co-directing is that you see things differently and can't agree, and the whole thing becomes a mess. The advantage of co-directing, though, is that when one guy gets really focused on something, the other guy can step back and look at it objectively. If you are in too deep on something, sometimes you can't tell if it is good or not. So it's a huge advantage to have this second person that can look at it with fresh eyes.

In what ways was your visual effects experience beneficial to the directing process? I would imagine it helped to keep effects costs down, if nothing else, because you could pinpoint, very sharply, where you wanted your effects dollars and hours to be spent.

GREG: Yeah, definitely. The march to the finish was a very straight line. There were a couple of sequences where we had a plan that sounded really good on paper and we ended up doing something different, just because we weren't as thrilled with the original idea from a visual standpoint. But, generally, we didn't waste time or money. We've been on movies as visual effects supervisors where we get a good shot on Take 4, but they have us go to Take 20, which they don't like at all. So we say, 'Remember that version a while back?' And they go, 'Oh, yeah, that did look good.' We were able to avoid all of that tail-chasing. We weren't perfect, of course. There was some of that, just because experimenting is part of the creative process. But we had a lot less of that than you normally get. We kept the waste to a minimum.

I assume Hydraulx did all of the digital effects.

COLIN: Hydraulx did 460 visual effects shots; and then CIS did some fixes for 40 or 50 shots. In addition to doing the effects here, we set up editorial and the D.I. at Hydraulx, and we did the final assembly and color grading here, as well. So we did all of post under one roof, which was really cool. That's the model for the future, to have everything under one roof. That's not how it usually is, though. Typically, editorial is like an island with this big fortress wall around it.

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Unable to contain the alien infestation, the Army calls in a nuclear bomb strike to destroy the town and everything around it. Greg and Colin Strause shot a plate of mountains woods in Canada, where the production was based. After principal photography wrapped, Hydraulx built and animated a digital helicopter and composited it into the plate, along with a simulated nuclear explosion. The effects team also augmented the shot with additional CG trees.

GREG: As an effects company, we're used to the fact that we're not going to get much access to the director during editorial, and that we're not going to know what the hell he's thinking — but it's not a good situation. Having everyone accessible to everyone during post, and having everything under one roof, really streamlined the post process. We were able to do our visual effects reviews in the D.I. bay, in a highly color-controlled environment. We could do screenings of the entire movie for all of the visual effects artists, so they could look at shots in the actual cut. It was awesome.

What plans do you guys have for the future? Would you like to do an AVP3?

GREG: Yeah, and hopefully we can bring in some elements of the story we pitched for the first AVP. We'd like to do that, as long as we can come up with a story that isn't cost-prohibitive. The way we look at it, we're just at the beginning of our movie careers. There are things cookin'.

Just 12 years later — after founding and running a successful visual effects company, Hydraulx, and directing a number of commercials and music videos — The Brothers Strause made their feature film directing debut with *Alien Vs. Predator: Requiem*, a Christmas 2007 release from Twentieth Century Fox. Sans pizza boxes and denim cut-offs, I talked to the brothers about their professional journey from the *Pacific Palisades* apartment to the *Big Time*, their transition from visual effects supervising to directing a major motion picture, and their plans for the future.

There's a T-shirt slogan that says, '...but what I really want to do is direct.' There are a lot of people in the visual effects community who feel that way, but most never make that transition. Tell me how you segued from visual effects to directing.

GREG: It started with music videos around 2000, after we'd been in L.A. for about five years. Back in those days, the music video world was very much a guerrilla operation. It was like the Wild, Wild West, which made it more likely that someone would just hand you a camera, and say, 'Go over there and shoot some stuff!' And that's how it started. They'd have us shoot some elements. Then they started having us shoot stuff with the talent. It grew until, finally, a producer said, 'Why don't you guys go ahead and direct the whole music video?' And we were like, 'Uhhhhh, I don't know, are we ready to do that?' And four weeks later we got a call — 'I've got a music video job for you!' And we were like: 'Oh, shit. Okay, I guess we'd better be ready.'

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What was the first music video you directed?

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GREG: No. The problem was that our vision for the movie was a crazy \$150-million space epic, and the studio wanted to do something more in the \$50- to \$60-million range. Paul Anderson ended up doing it, and it did very well at the boxoffice and on DVD. In the meantime, we kept building our reel. We'd done some short films, and we'd done the effects for some big Fox movies. So the people over at Fox started becoming more familiar with us. We did effects for *The Day After Tomorrow* and won the BAFTA for that. Then we did effects for *Fantastic Four* and *X-Men 3* — and it was during *X-Men 3* that we got the script for *AVP2*. We came up with a bunch of ideas for it, and went in and did a presentation at Fox; and at that point, all the stars aligned. They had come to trust us and like us for our effects knowledge and style, and we had a lot of cool ideas for the movie. So everything came together, and they said, 'Let's go for it.'

What were some of the ideas you brought to the *AVP2* script?

COLIN: Well, for one thing, in the script we first saw, the predalien creature died on page 2, in the first minute of the film! And we were like, 'Nooo!' People would have thrown tomatoes at the screen if we had done that. Here was this cool new creature, something that had been hinted at in the last movie, and you kill it off right away? We thought it was definitely something that had to be paid off. We'd seen aliens in five movies at this point, and predators in three films. We thought that the audience was ready to see something new.

GREG: Also, we felt that over the last few movies the franchise had moved away from what had made them successful in the first place — the fact that they had been so dark and scary and gritty. Both *Alien* and *Aliens* were really horrifying films. *Aliens* scared the piss out of us when we were kids! But as the franchise went on, the movies drifted away from that tense, scary quality — and we wanted to bring that back with this movie. We wanted an 'R' rating. We wanted to go hardcore — and we did. There is some bad stuff in this movie.

Once you got into directing the movie, did you find that your music video and commercial spot directing experience was valuable? Or was directing a feature film a completely different animal?

COLIN: The main difference had to do with endurance. The longest commercial shoot, probably ever, would be like two or three weeks. The longest we'd ever done in our career was a one-week shoot. Usually, they are two or three days. So we went from a directing job that typically lasted two or three days to one that lasted 52 days. With tests and everything, we had 11 straight weeks of shooting.

GREG: And that was pretty short for a movie. That added more pressure on us, because we had to move on this shoot. We had 42 company moves in 52 days. Sometimes we'd spend the morning shooting an entire dialogue scene; and then we'd pack everything up, go to the next place, and shoot the next thing. Because of the limited time, we had to make quick decisions about what was really necessary and what wasn't. If we didn't need a second angle on something, we didn't do it.

Through your visual effects work, you two have obviously developed an eye for dynamic action sequences, for building suspense, for dealing with creatures and that sort of thing — but what about directing actors in dialogue scenes? Was there any insecurity about doing that?

GREG: We'd be lying if we said there wasn't any concern about that, just because we hadn't done a lot of dialogue stuff prior to this movie. But Colin and I are picky guys, and we're big fans of cinema; and so we had a pretty good grasp of performance level and intensity. If you watch thousands of movies, as we have, you get a sense for it.

Having a sense for performance isn't the same as directing an actor's performance, though.

GREG: No, it doesn't make up for never having actually done it. Blocking scenes out, especially, was a real learning experience. You can't just have the actors standing there. If you look at how the masters like Spielberg do it, they always have fantastic blocking in their scenes. That was something we had to learn to do.

What kind of look, overall, did you want for the film?

GREG: We wanted it to be very cinematic, dark and contrasty. Daniel Pearl was our cinematographer, and we chose him because he shot *The Texas Chainsaw Massacre*, which was a tonal reference for us when we went in to pitch AVP2. We said we wanted to do Texas Chainsaw Massacre with aliens and pred-ators running around. That was our philosophical statement, at its most simple and basic.

As visual effects supervisors, you guys have worked with a lot of directors. Is there a particular director you've learned from the most?

COLIN/GREG: (simultaneously): Cameron.

COLIN: Jim Cameron would be #1. We worked with him on *Titanic*. We weren't on set for that, but we used to drive up to his house with Mat Beck to look at stuff. Watching him in post was amazing, just seeing how incredibly sharp his eye is.

I thought I detected some 'Cameron blue' lighting when I first saw the AVP2 trailer.

GREG: That was intentional. Again, because we thought the last couple of movies in the *Alien* franchise had moved away from the roots, we wanted to tie AVP2 back to the earlier films, visually. If you watch *Alien* and *Aliens*, those two movies hold together beautifully. In *Alien Resurrection*, they started experimenting with different color palettes, and it was a whole different kind of movie. Our idea was to get the franchise back on the right path and to bring back elements that would feel

familiar to the audience. That blue color was a dominant element, even in the first *Alien*. We used that same palette so that, subconsciously, when people were watching *AVP2*, it would feel familiar to them, as if it was in the same family as the first two movies.

What, specifically, did you pick up from Cameron when you watched him doing post work for *Titanic*?

COLIN: He has the best and most consistent eye for feedback ever. The guy would see something, even looking at it on a really crappy monitor, and he could tell you exactly what was wrong with it and what you needed to do to it. Some directors get very flip-floppy, and you wind up going in circles. Cameron's not like that at all.

GREG: He knew exactly what he wanted ahead of time. It wasn't like, 'Show me three versions of something and I'll pick one.'

COLIN: 'And then I'll have a whole new set of notes on that!'

GREG: Because he had that vision in his head, from the beginning, if what you gave him wasn't right, he knew it immediately. He was always able to give you very clear, precise directions.

COLIN: But he never wanted to give those directions twice. Once he'd told you, you'd better get it, or there would be yelling. And that was an interesting lesson we learned from him, too. As a director, everyone is supposed to be working for you; but at the end of the day, some people aren't as committed to the movie as you are. And it gets very frustrating when you feel as if people aren't giving you everything they could. Sometimes the only solution is to put the fear of God into people.

GREG: Everyone knew that if they didn't do it and do it right, there was going to be hell to pay. Either you're 100-percent committed to the project or you're part of the problem.

You guys seem pretty jovial and nice — were you able to put 'the fear of God' into people on this project?

GREG: I wouldn't say that; but if something was really substandard, we let our feelings be known. The atmosphere on set was generally pretty positive.

Tell me about co-directing a movie. How did that work, logistically?

GREG: The most important thing was to have one shared vision for the movie.

Was that hard to come to?

GREG: It depended. On some things we saw 100-percent eye-to-eye; on other things, we had different ideas. But that was all figured out by the time we got on set. It had to be.

So all the knockdown, drag-out fights were happening off the set.

GREG: That's right. They gave us a nice trailer for that. (laughs) The risk of co-directing is that you see things differently and can't agree, and the whole thing becomes a mess. The advantage of co-directing, though, is that when one guy gets really focused on something, the other guy can step back and look at it objectively. If you are in too deep on something, sometimes you can't tell if it is good or not. So it's a huge advantage to have this second person that can look at it with fresh eyes.

In what ways was your visual effects experience beneficial to the directing process? I would imagine it helped to keep effects costs down, if nothing else, because you could pinpoint where you wanted your effects dollars and hours to be spent.

GREG: Yeah, the march to the finish was a very straight line. There were a couple of sequences where we had a plan that sounded really good on paper and we ended up doing something different, just because we weren't as thrilled with the original idea from a visual standpoint. But, generally, we didn't waste time or money. We've been on movies as visual effects supervisors where we get a good shot on Take 4, but they have us go to Take 20, which they don't like at all. So we say, 'Remember that version a while back?' And they go, 'Oh, yeah, that did look good.' We were able to avoid all of that tail-chasing. We weren't perfect, of course. There was some of that, just because experimenting is part of the creative process. But we had a lot less of that than you normally get.

I assume Hydraulx did all of the digital effects.

COLIN: Hydraulx did 460 visual effects shots; and then CIS did some fixes for 40 or 50 shots. In addition to doing the effects here, we set up editorial and the D.I. at Hydraulx, and we did the final assembly and color grading here, as well. So we did all of post under one roof, which was really cool. That's the model for the future — but that's not how it usually is. Typically, editorial is like an island with this big fortress wall around it.

GREG: As an effects company, we're used to the fact that we're not going to get much access to the director during editorial, and that we're not going to know what the hell he's thinking — but it's not a good situation. Having everyone accessible to everyone during post, and having everything under one roof, really streamlined the post process. We were able to do our visual effects reviews in the D.I. bay, in a highly color-controlled environment. We could do screenings of the entire movie for all of the visual effects artists, so they could look at shots in the actual cut. It was awesome.

What plans do you guys have for the future? Would you like to do an AVP3?

GREG: Yeah, and hopefully we can bring in some elements of the story we pitched for the first AVP. We'd like to do that, as long as we can come up with a story that isn't cost-prohibitive. The way we look at it, we're just at the beginning of our movie careers. There are things cookin'.

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Chas Jarrett on Sweeney Todd

Article by Estelle Shay

As a filmmaker, Tim Burton has earned a reputation for crafting films that are quirky, visually arresting, frequently dark or gothic, and above all, original. His latest — *Sweeney Todd* — based on the 1979 Stephen Sondheim musical about the ‘Demon Barber of Fleet Street,’ is all of those things, and more. Having eyed the property for years, Burton convinced his frequent partner in crime, Johnny Depp, to take on the plum role of Benjamin Barker (aka Sweeney Todd), a man sent to prison under false charges by a lecherous judge who covets his wife and child. After serving 15 years of hard labor, Todd returns to London with not much else but vengeance on his mind, and partners up with the equally unhinged shopkeeper Nellie Lovett (Helena Bonham Carter). The two then proceed to slice and dice the local inhabitants, serving them up as meat pies to unsuspecting patrons.



To help realize his vision for the macabre tale, the director called upon visual effects supervisor Chas Jarrett and The Moving Picture Company, a frequent collaborator on Burton’s projects. Chief among the visual effects challenges was the re-creation of a gritty and squalid Victorian-era London. Burton’s initial inclination had been to shoot the live-action using minimal sets and extensive greenscreen — an idea that Jarrett obligingly explored in preproduction. “We began to test with greenscreen techniques,” Jarrett recalled, “and the shots were completely convincing. We produced tests both for daytime and nighttime environments that looked very realistic, and obviously were very controllable. But I think Tim soon found that having his actors in an all green set — especially when they had the added effort of singing — was just a bit too impersonal. The greenscreen stage is a very empty environment, and it can be quite distracting. So once Tim began to rehearse, the movie became smaller in scope in that he started to focus more on interior and quite intimate environments as a way of giving his actors more around them that they could connect with and play off of.”

During preproduction, Jarrett worked closely with Academy-Award-winning production designer Dante Ferretti to pin down a look for the London exteriors. “It was interesting, because the word ‘stylized’ was used quite frequently in preproduction. But it soon became clear that we didn’t necessarily have a perfect definition of what ‘stylized’ meant. A really huge cue for that came when Dante was recruited to the show. The stylization that he was keying on was still realistic-looking,

but it had a kind of theatrical staginess to it. The sets had to look real and comfortable, as if things were made of real materials. But a window would be placed in a very particular spot, and the light would stream through it in a very particular way, and cast a very particular shadow. So the framing and composition of images were very considered.”

As Ferretti and his crew began construction at Pinewood Studios on a dozen or so full-size sets, Jarrett and MPC digital effects supervisor Gary Brozenich — who was instrumental in a lot of the visual effects design work — mapped out their own approach to the virtual environments that would expand the real sets on a grand scale. Shots included everything from simple set extensions involving one or two views, to highly complex 360-degree views, to all-CG photoreal environments. “Ninety-five percent of the time, even our matte paintings were based on photographs of real London buildings that were projected back onto 3D objects, placed into position, given rough lighting, and then worked on top of that. So it was mostly a 3D-based approach.”

Period photos and paintings provided the visual effects team with its initial frame of reference. “Tim had found a lot of photographs that he felt portrayed the right sense of theatricality — interesting black-and-white images from the turn of the century — and he shared those with us. We took that as a jumping-off point to go out and just photograph London in huge depth, because we wanted to use a photogrammetry technique for as many buildings as we could, rather than creating them from scratch. We had very specific requirements for the type of images we needed, and our visual effects photographer, James Kelly, spent months and months trolling through London annoying people who owned houses and buildings, asking if he could photograph them. London still has many of those old buildings from the pre-Victorian era, so much of it was very usable. It was a big data-wrangling effort, but that was our main research. We put it all in a big bible, and then we would sit with Dante and choose buildings that we felt were appropriate for the period and for the look. And although those buildings, in reality, weren’t next to each other, we would cut them out and stick them next to each other, kind of redesigning streets based on them, and doing rough layouts in CG.”

To turn those rough layouts into photoreal CG environments that matched the live-action sets, MPC’s research and development team devised a custom lighting tool, ‘Isis,’ that expanded on the photogrammetry approach. “The basic concept is that you take a calibrated camera and you photograph your building from a number of different perspectives — we’d shoot anywhere from two to twelve positions — and with a number of bracketed exposures. Then Isis takes all of those images and looks for similarities between them; and where it finds points that correlate, it will effectively create a 3D point for those details. When you have a lot of images and a lot of these corresponding points, the result is that you get a very basic 3D model based on your photographs. The system then allows you to go in and refine the model by adding lots of detail to make it a perfect production model. But what you always know is that you have photographs that line up perfectly to it. So ultimately, you can take the original photos, combine the multiple exposures from each position into one high dynamic range image, and the system will project that image back onto the CG model you’ve created, in effect texturing it.

“The aim was to get as much of the textural quality of the buildings from the photographs as we possibly could, because these buildings had enormous history and character to them. A lot of that is

in the look of the materials they're made from — stone that's been weathered for 200 or 300 years, woodwork that's been eaten by woodworms — details that make it feel more real. Rather than have an artist sit there and try to paint in that history, if you can capture it from these really high-resolution images, then you're a long way there. Isis allowed us to do that.”

Extensive previz, led by previz supervisor Martin Chamney, also proved invaluable in designing the look of shots and determining the scale and scope of the environmental work. “The previz really helped us to understand the size of the London we were going to have to create, and allowed us to choose the best methods. For me, it was also a very technical resource. We did a lot of technical previz where we would take a sequence that was going to be a CG environment, and create reams and reams of printouts for the art department on set, so we could mark the floors and figure out what world was going to be around you when you were standing on a greenscreen stage.”

Sweeney Todd opens with a dark and moody view of the mist-enshrouded Thames, as a sailing ship with Sweeney Todd onboard looms out of the fog to dock in the harbor. The opening shot, which came up late in the show and hence was not part of the original previz, was nearly all computer fabricated by MPC. “That was actually one of the simpler shots in the movie, but also one of the nicest-looking. The boat itself is fully CG, and the ocean is fully CG, but the wake in front of the boat, where the water is teeming to the left and right, is real. For that we sent a cameraman down to the Thames and shot boats coming towards camera, then just rotoscoped out the splashy elements and comped those in.” Atmospheric effects were culled from reels of smoke and fog elements obtained in a big element shoot. “We used CO2, incense smoke and various different types of smoke machines and smoke pellets — just to create a variety of different looks because we knew we were going to use that — and we layered those elements as the boat comes through. Things like sails flapping on the boat were actually a 2D warping effect the compositor did to make the static sails appear to flutter in the wind.” The camera cuts to a view looking toward London’s historic Tower Bridge, then travels down the riverbank, taking in the dockside activity. Views of the riverbank included digital water and 3D bridge, with greenscreened people composited into the shot, along with mist and fog elements.

As Sweeney disembarks, the camera zips down narrow, claustrophobic streets at an impossibly rapid clip in a quirky POV shot dubbed ‘London Assault.’ The all-CG shot served to establish the look and feel of the film, and provided a convenient way to get from dockside to Fleet Street with minimal explanation. Bookended by seamless transitions in and out of the live-action that were shot without benefit of motion control, the London Assault was one of MPC’s most challenging sequences. “It was about 12 months of solid work for that one shot. Not only was it challenging because it’s all CG, it also had 27 live-action elements of people that had to be shot motion control and comped in.”



Director Tim Burton put his distinctive spin on *Sweeney Todd: The Demon Barber of Fleet Street*, based on the hit Stephen Sondheim stage musical about a homicidal barber in Victorian London who slices the throats of his patrons to satisfy an unfocused quest for righteous revenge. To set the period and the location, Burton engaged visual effects supervisor Chas Jarrett and a team at The Moving Picture Company to handle 362 visual

The speed of the camera move complicated the task. “We used a Super Cyclops rig, which can move faster than any other motion control rig I know of. But even with it moving at full speed, Andy Bull — who programmed the rig — still determined that we had to film at two frames per second. That meant that all our actors had to be moving at 1/12 normal speed so that when the film was played back at 24 frames per second, it looked like they were moving at the proper speed. Imagine walking up some steps where normally you’d take one step per second, and instead you have to take one step every 12 seconds. That takes enormous control. In fact, most people just cannot do it, because walking actually involves a bit of gravity, and gravity can’t be slowed down.”

Jarrett recruited a number of mime artists for the greenscreen shoot. “About half of the people in the shot were movement specialists, and our choreographer Francesca Jaynes — who was also our choreographer on *Charlie and the Chocolate Factory* — spent a couple of weeks working with them, teaching them how to move in slow-motion. We would film them moving at normal speed, then slow it down on video and show it to them so that when it came to actually doing the shot, they were all very well-rehearsed. Even so, it was extremely hard to shoot. We spent four days doing that one shot, just endless takes over and over again. But I have to say the actors were remarkable. When you watch the shot, you’d never know they’re moving in slow motion.”

The POV ends at Fleet Street and Mrs. Lovett’s pie shop. For exterior views of Fleet Street, Ferretti and the production art department designed and built a full-size set at Pinewood Studios, taking the buildings up to two or three stories — as high as the stage could reasonably accommodate. MPC then extended the set both vertically, up to five or six stories tall, and horizontally for several views looking down the long, narrow street. “In this case, we had no real buildings to go out and photograph for our extensions; so very often we would go onto the real set and do our photogrammetry, so that we had all the correct textures.”

Having learned of his family’s sad fate from Mrs. Lovett, Todd is reunited with his prized collection of shaving razors in his former flat above the pie shop, and vows to exact a murderous revenge on Judge Turpin (Alan Rickman), the man responsible for his misfortune. In a dramatic pullback, the camera moves through the second-story window, telescoping further and further back to reveal the cityscape from on high. “That was a real one-off shot; and because it was such a specific view looking down onto the buildings, acquiring all the information we needed for the rooftops was quite complex.”

Plate photography for the pullback was captured on the real set, with the camera mounted on a cablecam and pulled straight back from the window some 60 feet. MPC then tracked the camera move and rebuilt in 3D everything that the camera could see. “We camera-projected the filmed plate back onto our CG buildings in order to capture all of the textures, and then continued the pullback with our CG camera. As we got into set top-ups — vertical extensions of the Fleet Street buildings that were on the real set — we added roofs and the pie shop chimney with smoke billowing out. Then, once we had this big pullback camera animated, we hand-placed all of the buildings; and

effects shots that included large-scale set extensions in a digital environment, work and some 3D animation for the final shot. The camera was equipped with a Super Cyclops rig, which can move faster than any other motion control rig I know of. But even with it moving at full speed, Andy Bull — who programmed the rig — still determined that we had to film at two frames per second. That meant that all our actors had to be moving at 1/12 normal speed so that when the film was played back at 24 frames per second, it looked like they were moving at the proper speed. Imagine walking up some steps where normally you’d take one step per second, and instead you have to take one step every 12 seconds. That takes enormous control. In fact, most people just cannot do it, because walking actually involves a bit of gravity, and gravity can’t be slowed down.”

when you get about two or three blocks back, it begins to turn into multiple layers of matte paintings, and in the distance just hills and sky.”

Dramatic skies added just the right atmospheric touch to the shot. “Anyone doing visual effects for Tim Burton knows that getting a really good library of interesting-looking skies is one of the most important things they can do right at the beginning of the project. We probably spent more time trying out different skies on shots, looking for just the right composition and mood that worked, than almost any other element. In this instance, we ended up having it raining in the far distance, just off the horizon. If you look to the right, there are sheets of rain and a little flick of lightning, just to give it a slightly moody edge.”

In a stark departure from the dark, moody look of the London environments, MPC also created shots for a bizarre fantasy sequence in which Mrs. Lovett imagines life with Sweeney in a series of idyllic family tableaux featuring the couple picnicking under a tree on Hampstead Heath, sitting on a sunny beach punctuated by soaring birds and painterly skies, and strolling along a picturesque pier by the sea. Burton wanted those shots to have a completely different, otherworldly feel to them, more impressionistic than photoreal, characterized by bright, super-saturated colors. “It was an element that was challenging for us because we felt as if we’d begun to really establish the kind of vocabulary needed for Sweeney Todd’s world — and suddenly you’re out of it. Suddenly, everything is different. It was difficult to reconcile that.” Live-action for the sequence consisted exclusively of greenscreen photography of the actors integrated into all-CG backgrounds. “Nothing in those shots was real, except perhaps a bit of wood the actors were walking on for the boardwalk. We added the railings, extended the boardwalk in all directions, and added all of the people walking on it.”

To save time, Jarrett opted to employ real ocean photography for the beach scene, rather than create wholly computer generated seas. “When we did CG water on the Thames, we could get away with it because it was quite calm and dark and misty. But this was broad daylight, with waves crashing against the beach. So we took a film camera down to Brighton, which is on the south coast of England, and shot lots of water plates off the pier. Then we used a camera projection technique to project all those water textures onto a big flat plane, added some displacement and rebuilt the water in 3D.” The sandy beach was generated as 3D geometry, with matte paintings projected onto it.

Clever transitions from the heath to the beach and back again were filmed as one continuous shot, with no cuts. “We prevized those quite heavily. The first one was fairly simple, but the other was more complex. It starts with the camera looking down at the back of the couple sitting on a blanket on the beach at sunset, with the ocean and the setting sun in front of them. The camera cranes up and over the top of them in a big arc; and by the end of that arc, we’re back on the heath and it’s broad daylight. It was all pure greenscreen, with a lighting transition from sunset look to broad daylight look halfway through the shot. We framed it in such a way that as the camera was looking straight down on top of the actors, the blanket they’re sitting on completely fills the frame — and that was our transition point.”

When Sweeney’s bloodlust reaches critical mass, what follows is a grisly orgy of murder and mayhem that literally bathes the screen in blood as the body count rises. Wound and blood-spurting effects were, for the most part, achieved in-camera with the help of makeup effects supervisor Neal

Scanlan and his team. In addition, the prosthetics team provided corpse dummies for dropping down the chute to the bake-house, basing them on scans of the real actors provided by Gentle Giant Studios. MPC was called upon to make the blood appear more visceral and intensely red, and to embellish the practical blood effects in several shots. A digital approach was also employed for the film's grim conclusion in which Sweeney suffers the same fate as his victims, a veritable curtain of blood gushing from his own slashed throat. "That scene was a tough call. We were shooting chronologically, so it was at the end of the schedule, with all the attendant pressures. We'd discussed the idea of doing CG blood throughout that scene — on his neck, on his clothes and everything. But simulating fluid is complex — especially if it has to interact with cloth. So instead, I had the special effects team create a rig — a collar that went around Johnny Depp's neck and that would, on cue, let out enough blood to really soak into his clothes to give them that kind of glistening quality. Then we painted out the collar and completely replaced his neck, adding a CG wound and CG blood pouring out of it. Some of it included blood elements shot during postproduction on a green neck and comped in. Some of it was blood elements projected onto CG geometry and then warped into place. Not the most complex stuff, but I felt we could get a more naturalistic look that way."

Even more graphic were shots of Mrs. Lovett in flames, after the crazed and vengeance-obsessed Sweeney shoves her into the very oven the duo have been using to dispatch their victims. Jarrett and the MPC crew sought a delicate balance between realism and a slightly over-the-top sensibility in approaching the sequence. "We didn't quite know how gory to go. Unlike the other shots, this was not about blood. It was more about blackening and charring. So we shot reams of reference — sides of beef treated with a blow torch to see what would happen to burned skin. In early concept images we did of Mrs. Lovett, all the skin was completely burned away, and you could see all the bones underneath. It was kind of comical; but just a bit grotesque, as well. So we steered away from that, and ended up layering in more fire so you just caught glimpses of her face."



Judge Turpin (Alan Rickman) and his henchman Beadle (Timothy Spall) exit London's historic Old Bailey courthouse. Plate photography for the sequence was filmed on a stage at Pinewood draped entirely in greenscreen, with real stairs and a cobblestone floor serving as the only set dressing. Burton planned to use similar bare-bones sets for most of the film's exteriors and interiors, but ultimately opted for many full sets when he concluded that his actors would benefit from more tangible surroundings to ground their performances.

Since the oven had no real fire in it, MPC was also responsible for all of the interactive fire effects in the shots. “We ended up shooting lots of fire reference. I had a dummy built — a full size mannequin of Mrs. Lovett — and after we’d shot Helena in the oven with just some interactive lighting, we got a cut sequence from editorial and took our mannequin, which had steel poles attached to the arms, legs and head — onto a blacked-out stage. Then we had the special effects guys pour various liquids and gels onto it and set fire to it, and we puppeteered the mannequin to do the same motions that Helena did, using a looping playback system on the set. We shot lots of that for two days, and ended up with a big library of fire footage that we could comp into the shot. It was nice because you really got the sense that the fire was wrapping around her arms and properly interacting with her. The key was not to try to shoot all of the elements in one hit. We would set the right arm on fire and puppeteer that to match what Helena was doing in a certain shot. Then we’d set the left arm on fire and do the same. Then we’d set the chest on fire, then the face and the hair, and so on. So we’d have lots of different elements, with nine or ten takes of each for our compositing supervisor Marian Mavrovic and his team to pick and choose from.”

Helping Tim Burton realize the world of Sweeney Todd was, for Chas Jarrett, a dream assignment. “It doesn’t get any better than this. When you’re working with Tim you always know that it’s going to be really meaty, juicy work — full fat kind of stuff — particularly in this movie, because it’s such a character-driven piece. Tim was great at keeping it focused on that. And in some ways, the London we created was like another character in the film. Its presence is definitely felt — not too showy or ostentatious, but small and gritty and claustrophobic, and Tim’s vision for that was fantastic.”

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Digital artists integrated the greenscreen and motion control photography with an all-CG background – one of seven created by MPC for the show – that included a highly-detailed model of Old Bailey able to stand up to close scrutiny in the full-screen shot. Burton derived visual inspiration for the film from an assortment of old black-and-white horror movies, whose stylishly moody ambiance was replicated, even more richly, by the combined use of monochromatic settings, contrasty cinematography by Dariusz Wolski, and a digital intermediate process that stripped out most of what color remained.



Tim Burton confers with Johnny Depp on set. The pairing of director and actor was the sixth such union for the longtime collaborators, who share a taste for quirky, dark films and hero characters that are often outside the mainstream. In the transfer of Sweeney Todd from stage to screen, Burton sought to focus more on the intimate, emotional and character-driven aspects of the story, coupling that approach with a suitably claustrophobic and melancholy depiction of Victorian-era London.

Joel Hynek & Kevin Elam on *Jumper*

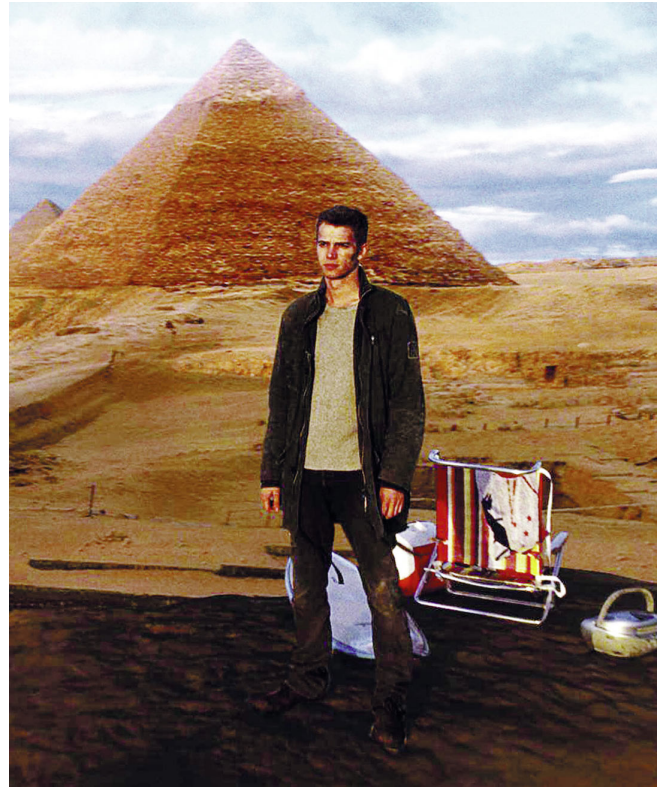
Article by Joe Fordham

Visual effects artists must have an understanding of filmmaking, photography, graphic arts and acting. Knowledge of anatomy can also come in handy, as can a familiarity with architecture, aviation, computer science and, occasionally, theoretical physics. Visual effects supervisor Joel Hynek drew on all of the above, and more, when he joined forces with visual effects supervisor/producer Kevin Elam for the shooting of director Doug Liman's 20th Century Fox and New Regency science fiction adventure *Jumper*.

The film is based on a Steven Gould novel about a teen who discovers the ability to teleport between locales. The action spans more than a dozen countries as David Rice (Hayden Christensen) and fellow jumper Griffin O'Conner (Jamie Bell) evade a sinister cabal of Paladins — led by Roland Cox (Samuel L. Jackson) — intent on their demise.

When Hynek joined the production, work was already underway on research and development initiated by two earlier visual effects supervisors. "John Nelson first worked with producer Lucas Foster to develop story ideas with previsualization supervisor Laurent Lavigne," recalled Kevin Elam. "We began to incorporate those ideas into the story; and then John stepped off and Mike Fink came on board to develop jump effects. We built a set at New Deal Studios, set up a shoot and used those elements to begin testing at Rhythm & Hues, Digital Domain and Zoic. We were still not greenlit and Mike had the opportunity to work on *The Golden Compass*, so he left and we brought on Joel Hynek. I had known Joel for 20 years, since he gave me my first job in the industry on *Predator*, and I thought he'd be a good fit with Doug Liman."

Hynek worked with Liman to determine visual explanations for how the jumpers could conceivably teleport in instantaneous transitions. "We decided a jumper was in every place all the time," observed Hynek. "Like tuning a channel on a radio, they could appear in different locations depending on the frequency they tuned into. When a jumper left one location, he radiated in all directions." The visual effects team worked out five ways to depict a jump. "One was what we called an 'A-side Departure,' where a subject jumped away. Another was a 'B-side Arrival,' where a subject arrived in a space. We also had the 'POV Jump,' which depicted the jumper's point of view. We had the 'Camera Follow-through,' where the camera followed a jumper through a jump. The fifth



variation was a ‘Local Jump,’ where a subject jumped between locations while visible in a single shot.”

Hynek shot high-definition test footage in Los Angeles, on location scouts in Tokyo and Rome, and at the production base in Toronto, to supply vendors with raw material to test the concepts. “We wanted to give each jump a physical quality to make it feel more real,” said Hynek. “One idea was for a ‘vacuum condensation flow,’ which was one of the concepts John Nelson had originated. The idea was that a jump would create a strong vacuum that pulled air towards it and, as it cooled, any moisture in the air became a visible vapor. It was similar to the effect of an airplane landing in humid weather, where a vacuum forms over the top of the wing surface and causes water vapor to condense.”

The condensation flow effect was one of many concepts that special effects supervisor Yves De Bono’s team experimented with, using various mechanical rigs to create vibrations and explosions emulating forces associated with jumps. “We wanted to suggest a jump portal that was like a mini black hole,” stated Hynek. “It joined two spaces with very strong forces — be it air pressure, gravity or magnetic fields.”

To suggest dimensional distortions in jumps, the production shot multiple perspectives of jumpers that flickered in and out of view at the moment of the jump. “We shot the jumper with two cameras offset two or three feet apart,” explained Hynek. “We then very quickly jumped between those angles, creating the idea that there was a transition from one spatial orientation to the other.” Hynek also experimented with a *Matrix*-style camera array of 12 to 16 digital still cameras programmed with varying exposures to create the effect of a collapsing motion blur. “The still camera array worked well when the jumper was in motion, but it was hard to shoot and took a lot of time to set up. As we did more testing, we realized a 12- or 16-frame effect was too long, so instead we used a three-camera beam-splitter rig to catch three frames of expanding motion, like a powerful whoosh of a jumper leaving a space.”

Residual effects of teleportation left a shimmering wake. “We had a concept we called the ‘crystal cavern,” noted Hynek. “The idea was for a jumper to pass through an environment where light from the next environment reflected off the surfaces of the fracture, like splinters in glass. That evolved into what we called the ‘gelatin jump,’ where we had a flexible volume in a gelatin-type surface, so as the jumper punched through, he left rippling shockwaves.” The refractive rip, or ‘jump scar,’ varied with its user’s state of mind. “Four factors affected the jump: skill level, intention, whether a jump was destructive or stealthy, and the jumper’s emotional state. If David was in control, he could be precise. If he was freaked out, he’d let loose a lot of energy. We plotted David’s emotional arc on a graph and used that to design the style of each jump.”

Weta Digital Hydraulx and a host of additional vendors joined the project, working with Kevin Elam and visual effects producer Ellen Somers in postproduction. Vendors made use of elaborate precomposites of elements devised by visual effects artist Joseph DiValerio at Space Monkey. “Joe was Doug’s secret weapon,” commented Kevin Elam. “He works in 3D and 2D. He helped us with early R...D and set up our precomp pipeline, doing composites of video dailies and temps of visual effects that we could drop into our cut, which was instrumental to the way Doug likes to work.”

The film's first jump effect occurs as a young David (Max Thieriot) ventures onto a frozen river, falls through the ice and involuntarily jumps to a nearby library, where he reappears amid a flood of water. The production shot the above-ice parts of the scene on location in Ann Arbor, Michigan. Thieriot performed underwater angles in a water tank in Rosarito, Mexico, plunging through fake ice that Yves De Bono's team created using paraffin wax. Then, on location in Peterborough, Ontario, Liman filmed David splashing down into the library with a practical water effect. Hydraulx visual effects supervisor Edson Williams generated a camera follow-through effect by blending between the underwater and library plates.

David practices his jump technique by teleporting in and out of bank vaults. Weta Digital visual effects supervisors Dan Lemmon and Erik Winqvist depicted the early jumps with violent jump scars enhancing physical effects of the fragmenting bank vault interior. David is next seen in his twenties, casually using local jumps to move around his luxury Manhattan apartment. Hayden Christensen choreographed jumps in time with a motion control camera that prowled with him through the apartment. "We worked out a long camera move and had Hayden perform jumps in different parts of the move," explained Hynek. "We used video playback to overlay takes to help Hayden anticipate his moves. As he walked toward the kitchen, he prepared to open the refrigerator in the 'A' part of the move, and then continued that motion in the 'B' part of the move."

Sandbox Digital visual effects supervisor John Nugent generated greenscreen set extensions for views through the windows of David's apartment. Weta Digital generated jump transitions and subsequent scenes of David jumping to foreign ports of call, including a scene of him perched on London's Big Ben clock tower. "We did not shoot in London," related Kevin Elam. "Joe DiValerio created a temp shot of David standing on the Big Ben clock face that was so good it ended up in our first trailer. Weta Digital then created Big Ben and London as painted textures that they built from photographs."

At the end of his whirlwind world tour, David takes lunch on top of the Sphinx in Egypt. Hynek and plate unit supervisor Avram Ludwig shot Vistavision aerial plates of the Sphinx using a jury-rigged SpaceCam on location. “The Egyptian military flew us with the SpaceCam on a rocket launcher mounted to the biggest helicopter I’ve ever been in,” commented Hynek. “The government censors flying with us did not want us to shoot anything except the Sphinx and pyramids, and when I took stills they demanded that I give them the flashcard to decide if the images were okay. The same was true for our Vistavision footage, which was unfortunate because it had to be processed locally and there were a lot of processing problems. I did wonder, after they saw how we put Hayden up on top of the Sphinx with his Subway sandwich and his beer cooler beside him, if the Egyptian authorities might put a contract out on Doug Liman. But they let us keep everything.” To place David on the Sphinx, Joe DiValerio motion-tracked Cairo plates and Hynek used the data to shoot a motion controlled Spydercam element in Rosarito of Hayden Christensen sitting on a reconstruction of the top of the Sphinx head, which Weta composited into plates.

David’s excursions are interrupted when Paladin leader Roland Cox bullies the young jumper into submission by using electrically charged restraints. The property and special effects departments built practical versions of Paladin tethers, prods and, for a later sequence, spring-loaded nets that were enhanced by visual effects. “The purpose of the Paladin tools evolved in Doug’s mind,” said Hynek. “Eventually, the nets and the tethers became electro-shock devices, which kept a jumper from being able to jump as he was electrocuted.” Weta Digital generated electrical effects, including a jump effect known as the ‘glass guy’ effect, which used digital doubles of performers built from scans by XYZ RGB to animate volumetric electrical charges filling a jumper’s body.

Paladins attack David while he is romancing his childhood sweetheart Millie (Rachel Bilson) in Rome. The production filmed the sequence partially on location in Italy, in and around the ancient Colosseum gladiatorial arena, and partially on a soundstage set that production designer Oliver Scholl built in Toronto to represent the Hypogeum trenches that ran beneath the arena’s wooden floor. For trench up-angles revealing the Colosseum above, visual effects placed bluescreens above the Toronto set and Soho Visual Effects initiated development of a digital Colosseum extension, which Weta Digital took to completion and integrated into plates.



David Rice (Hayden Christensen) teleports himself to the top of London’s Big Ben clock tower in Jumper. The film reunited director Doug Liman with visual effects producer Kevin Elam, with whom he had previously collaborated on Mr. & Mrs. Smith. Jump effects required lengthy research and development followed by a globetrotting shoot with visual effects supervisor Joel Hynek. Elam then oversaw visual effects through post with visual effects producer Ellen Somers and nearly a dozen vendors. Weta Digital handled David’s jump to London, integrating Christensen into a digital model of Big Ben.

Griffin arrives to help David defeat the Paladins using jump techniques with acrobatic martial arts flair. Stunt coordinator Simon Crane and visual effects used wirework and multiple stunt performers to create the impression of Griffin leaping, vanishing and reappearing about frame. “We filmed multiple Griffins in each shot,” said Kevin Elam. “As our Paladins were fighting, one stunt Griffin would swing a kick and spin around, and a second Griffin would continue the action in another place. We then painted out the first Griffin and revealed the second, so he appeared to jump from place to place.”

Three stuntmen performed Griffin actions in the Hypogeum set wearing prosthetic likeness makeups of Jamie Bell. Weta Digital used digital face replacements to augment the illusion and generated jump effects from one performer to the next using motion blur textures gleaned from the beam-splitter rig and a handheld digital still camera. “I used a Canon EOS 5D to take pictures of actors performing a jump,” said Hynek. “I varied exposure times to create different amounts of blur. Jamie would start his action in the same spot and then move about in different ways as I clicked away. That gave us some cool-looking frames that we used as part of the transition.”

Griffin and David team up in Tokyo to sabotage a Paladin research laboratory, first stealing a Mercedes by jumping the car through a showroom window and racing through gridlocked traffic. Liman shot performers on location in the heart of the Japanese capital, starting the Mercedes action inside a Tokyo dealership and shooting a greenscreen element of the car skidding to a stop on a backlot street. Weta Digital modeled a digital Mercedes to transport the vehicle from showroom to street level and tracked the CG car into aerial shots, animating the Mercedes performing local jumps, hopscotching through traffic.

The jumper alliance results in a personality clash and duel between Griffin and David as they pursue each other across the Sahara desert, then jump to New York City, the Arctic and an Eastern Block war zone. For the chase across the dunes, the production shot SpaceCam footage from a jeep scaling dunes in Cairo and captured additional photography in *Baja California*. For long shots, Weta Digital integrated bluescreen footage of Hayden Christensen and Jamie Bell running on a treadmill with digital doubles, and layered city plates behind the dunes to represent distant Dubai.



The visual effects team explored many concepts to depict phenomena associated with jumps, including the residual effects of the dimensional distortion, known as a ‘jump scar,’ through which characters and objects in close proximity could pass. As David Rice masters his jump technique, he forms an alliance with a fellow jumper and punches through a jump scar, inserting his fist into a neighboring dimension. Weta Digital created the effect -- based on a design by visual effects artist Joseph DiValerio at Space Monkey -- using a 3D jump scar model that digital artists manipulated by controlling size, shape and animation parameters.

New York City scenes incorporated digital doubles and greenscreen elements of performers on a partial set in Toronto into aerial plates of the topmost observation deck of the Empire State Building. Weta Digital also used aerial plates and created a CG environment of the Empire State Building as backgrounds behind greenscreen elements of David and Griffin leaping off the skyscraper and plummeting downward.



Rice relaxes at the end of a hard day's recreational jumping by transporting himself, with surfboard and beer cooler, to the top of the Sphinx in Egypt. Joel Hynek and plate unit supervisor Avram Ludwig shot visual effects plates with the cooperation of the Egyptian military on location in Giza. The aerial Vistavision footage, swooping around the Sphinx, became the basis for a motion-controlled Spydercam shot of Hayden Christensen, filmed seated on top of a partial Sphinx head set that production designer Oliver Scholl built in Rosarito, Mexico. Weta Digital then composited Christensen into production plates.

David takes refuge in the Arctic until Griffin reappears, careening across the ice in a Costa Rican fruit truck. Visual effects had planned to create the frozen terrain digitally, until the production discovered a practical location in Michigan. “We found a place just outside of Detroit,” said Hynek, “on Lake Erie, where ice stacks up because of the prevailing Westerlies. It created huge piles of ice that looked like the Arctic.” For scenes of the fruit truck jumping into a Chechnyan war zone, Simon Crane’s team simulated a battle-torn landscape in an abandoned power station in Toronto. “They hung a truck on a crane and let it drop. After it had fallen, we shot our actors in the truck until a tank ran them over. The driver was supposed to be crushed by the tank, so I slow-mo-animated stills of the driver so we could put him in later.”

The jumper-versus-jumper sequence climaxes with David trapping Griffin in a collapsing electric tower in the war zone. Conceived in post, and designed with Weta, the sequence was filmed in Prague. Production supplied the tower base, while visual effects shot tight coverage of the action against greenscreen. Weta created the digital collapsing tower and CG environment. “I was pretty nervous about trying to do such a huge CG scene so late in the game,” said Elam, “but Dan, Erik and their team at Weta really came through for us. The sequence looks fantastic!”

Griffin performs an even more bombastic jump earlier in the film, attacking Roland outside the jumper’s Sahara hideaway using a double-decker bus purloined from the streets of London. Yves De Bono, Simon Crane and stunt coordinator Wade Eastwood staged the bus leap as an astonishing full-scale practical effect in Toronto. “We had a big backlot sand set representing the outside of Griffin’s lair,” said Hynek. “Yves De Bono and his team took a real bus, removed the engine and built a rig that could marionette the bus over the dune. They had two huge cranes with massive cables and a very complex rig for moving the bus along.” Staged in two shots, the bus was first filmed crashing into a sand berm, and then, in a wider angle, spinning on its axis. “They tested the spin as a miniature, then wrapped a rope around the full-scale bus, lifted it up, pulled the rope and made the bus unwrap.” The production then shot Samuel Jackson reacting as the bus threatened to flatten him, and Weta Digital combined the elements.

The biggest jump effect occurs during the film's finale when David rescues Millie from Paladins who are holding her hostage in her apartment, jumping from the apartment in downtown Ann Arbor to a local river. The production shot the sequence on water-sprayed sets in Toronto and on gimbal apartment sets built by Yves De Bono's team. "The initial idea was that David jumped so fast he opened up a portal that brought the river into the apartment and flooded it," related Elam. "That changed, and Doug brought us back to one of our original ideas of David literally teleporting the third floor of the apartment into the river. We used footage from the apartment set shaking on a gimbal and combined that with greenscreen footage of a partial set with CG set extensions coming apart. The teleportation happened in a wide shot of the apartment generated completely in CG as the apartment is torn from the building and lands in the same river we saw in the beginning of the movie." Hydraulx handled visual effects for the scene using digital water simulations, water elements created by miniature supervisor Mike Joyce at Cinema Production Services, location plates shot in Ann Arbor and digital set reconstructions of the apartment disintegrating and sinking.

"It was a wild ride," concluded Joel Hynek. "Working with Doug Liman was a constantly evolving creative process. One of the reasons his films are so fresh, I think, is because he's always thinking about how to improve a scene. Whenever an idea popped up, he listened; and, whether he used that idea or not, it was always for the betterment of the film."

"Doug is fearless!" Kevin Elam concurred. "And you've got to be pretty fearless to go with him. I think a lot of people in visual effects might have paled at some of the crazy stuff we attempted, but Doug had a conviction that we could pull it off. Sometimes the wildest ideas are absolutely the right choice."

Jumper photographs copyright © 2007 by 20th Century Fox.



In the Sahara, Roland Cox (Samuel L. Jackson) – head of an organization seeking the demise of all jumpers – sees a London double-decker bus materialize and hurtle toward him. Special effects supervisor Yves De Bono and the stunt department staged the jumping bus as a full-scale practical effect in Toronto. De Bono's team stripped the bus of its engine, suspended it on cables, swung the vehicle like a giant marionette through a sand berm and, in a second take, flipped it on its axis. Weta Digital combined the bus with an element of Jackson filmed separately.

Mike Nichols' War

ARTICLE BY JODY DUNCAN

Throughout the 1980s — while many Americans were coming to terms with the AIDS epidemic and Reaganomics, grooving to Bruce Springsteen's *Born in the U.S.A.* album, and standing in long lines to see *E.T.: The Extra-Terrestrial* — a hard-drinking, womanizing congressman from Texas, Charlie Wilson, was waging a secret war against the Soviet Union. Aided by Houston socialite Joanne Herring and rogue CIA agent Gust Avrakotos, Wilson fought



to fund and arm the mujahideen fighters of Afghanistan — a country few Americans could pinpoint on a map — against the powerful Red Army, securing a defeat so devastating and complete, the conflict would be designated the Soviet Union's 'Vietnam' and would lead, indirectly, to its collapse.

In his 2003 book, *Charlie Wilson's War*, the late journalist George Crile recounted the behind-the-scenes war machinations in which Wilson — out of patriotic fervor and a sense of personal mission — engaged. Director Mike Nichols and producer Celia Costas took immediate interest in filming the real-life cloak-and-dagger story, and the Universal Pictures project finally came together in 2005, with a script by Aaron Sorkin and a cast headed by Tom Hanks as Charlie Wilson, Julia Roberts as Joanne Herring and Philip Seymour Hoffman as Gust Avrakotos.

After a long period of preparation, the production earned an official greenlight just weeks prior to the planned start of principal photography in Morocco, which would stand in for Afghanistan and Pakistan locations. Production then returned stateside to film interiors on stages at Paramount Pictures — due to a lack of available soundstage space on the Universal lot — and to pick up additional exteriors at Mystery Mesa in Santa Clarita.

On hand throughout the shoot were visual effects supervisor Richard Edlund and visual effects producer Liz Ralston, who oversaw the creation of 175 effects shots for the show. Edlund and Nichols had forged a successful working relationship when they collaborated on the lauded 2003 television miniseries adaptation of Tony Kushner's play, *Angels in America*. "I was very interested in doing *Charlie Wilson's War* because I'd had a really good experience with Mike on *Angels in America*," noted Edlund. "And he'd had a good effects experience on that show. In fact, he said it was his first positive effects experience. *Charlie Wilson's War* is not really an effects movie, but it needed a couple of hundred effects shots to help Mike tell the story."

Initially, Nichols intended visual effects to play a minimal role in the film, used primarily to extend Morocco and Mystery Mesa locations and to set the 1980s time period, but that minimal effects role expanded as the production evolved. "When we first started talking about it," recalled Liz Ralston, "there wasn't going to be a lot of 3D, and it wasn't going to be a big, physical war picture. The war shots were intended to be subtle and suggestive. But as we were shooting, and as Mike focused in on the story, we all realized that we were going to need more attack scenes — more 'war' in Charlie

Wilson's War. Boards were made and we shot plates to go with the boards; and then, in the cutting room, we worked out how the attack scenes were going to come together and what visual effects were going to be needed." Those visual effects were awarded to Whodoo EFX, overseen by visual effects supervisor Helena Packer and visual effects producer Sarah Paul. Robert and Dennis Skotak and their 4-Ward Productions team built and shot miniatures and provided other practical elements. Thaine Morris — who had worked with Richard Edlund as far back as *The Empire Strikes Back* — oversaw an additional element shoot.

After an introductory sequence that follows Charlie into the Langley CIA headquarters — where he is to receive an honor for his role in defeating the Soviets in Afghanistan — the movie flashes back to 1980 Las Vegas and the hot tub of a fantasy hotel suite, occupied by Charlie and a number of young, beautiful, naked women. Shot on a stage set built by production designer Victor Kempster, the scene required nighttime views of 1980s Las Vegas out the fantasy suite windows. "Vegas looks completely different now than it did in the 1980s," said Liz Ralston, "and we wanted to make sure that the view outside the windows reflected that. The fantasy suite was a pretty long scene, so we had about 30 shots in that sequence."

Freelance matte artist Roger Kupelian, working with conceptual artist Michele Moen, created a matte painting for the nighttime sequence, which included flashing and cycling neon signs and billboards trumpeting '80s-era Vegas acts. Whodoo EFX lead compositors Janice Lee and Eric Bruno massaged the digital imagery into final shots. "There was a lot of back-and-forth with Mike Nichols on that because he had very specific ideas of what he wanted it all to look like," recalled Helena Packer. "He wanted the view to look realistic — but 'realistic' in terms of how he wanted it to look, rather than how it really was. If there was something that he felt wasn't architecturally appealing — like the old Frontier Hotel, for example — he eliminated it."

Though Whodoo played a bit with the actual architectural layout of Las Vegas, the final digital matte painting represented — more or less — the view from the eighth floor of Caesar's Palace. To garner reference of the city in the appropriate time period, Whodoo and Kupelian looked at movies shot there during the 1970s and 1980s, as well as images on the Internet. "Specifically," noted Packer, "we looked at how all the different properties cycled their neon, and then we re-created that in our animated matte painting. We were lucky enough to find a piece of stock footage of Vegas traffic moving down the Strip, so we didn't have to animate all of that. The stock footage required some tweaking to make it fit into the shots, but the angle was close enough to what we needed that we were able to use it in the matte painting. Everything else, such as the cycling neon on the signs, was hand-animated in AfterEffects."

Stock footage also supplied window views for a subsequent scene with Charlie inside a chauffeured limousine moving down the Las Vegas Strip. A painstaking search through stock footage to find angles that would work outside the limousine windows and windshield failed to unearth a single usable piece of footage, requiring Whodoo to patch together and do timing offsets of multiple bits.



“Whodoo had to clean up the material and combine plates,” Edlund noted. “They also had to stabilize the stock footage — because it had been shot out of a car — and then put movement back in to make it look as it would out the window of the limousine. Even though it was just stock footage, Whodoo really made it work. Helena’s compositing people are outrageously good, and she is a real stickler for detail. She went the extra mile to put little sweeteners in there to make the shot.”

Directed by John Dahl, the film has a winning cast of young girls (played by friends of Dahl) who are the de facto stars. The film is a comedy, but it is not a farce. The director is a former member of the New York City Police Department, and he has a sense of humor. The film is a comedy, but it is not a farce. The director is a former member of the New York City Police Department, and he has a sense of humor. The film is a comedy, but it is not a farce. The director is a former member of the New York City Police Department, and he has a sense of humor.

Wilson's indulgences in Las Vegas land him in trouble when he returns to Washington D.C., where much of the film is set. Many scenes take place at Charlie's apartment, which has one of the best views in the city, with the Iwo Jima monument in the foreground, and the Lincoln Memorial and Washington Monument bracketing the background. Rather than send a unit to Washington to shoot establishing plates, Nichols opted to leave the creation of the D.C. exteriors — and even some interiors — to the visual effects team. "The majority of this movie takes place in Afghanistan and in Washington D.C.," Liz Ralston observed, "but we never went to either of those places!"

Using a Nikon digital camera, Edlund shot stills of Monument Row — the Lincoln Memorial, the Washington Monument and the Capitol — from Lady Bird Johnson Park, and shot the Iwo Jima monument from the elevator window of the ‘Top of the Town’ restaurant. “I also shot the Pentagon,” said Edlund, “because you can see that from Charlie’s apartment, as well. We cheated all of those things in a little bit closer, just to clarify the storytelling. Rather than a big aerial establishing shot, Mike Nichols established Washington D.C. with these understated views out Charlie’s apartment — which is very much his style.”

The hedonistic Wilson finds a cause beyond women, cocaine and Manhattan cocktails when he visits an Afghani refugee camp at the Pakistan border. Production filmed some refugee camp scenes in Morocco, but had to abandon the location due to bad weather conditions. “We had this whole set and about 800 Middle Eastern extras in Morocco for the refugee camp scenes,” recalled Edlund, “but we got blown out of that location when we were only about halfway through. This was in late October and early November, and we had every possible weather pattern — everything from beautiful, sunlit, Kodachrome skies to fog to snow to rain. Finally, there was a terrific windstorm that blew away the catering tent and the wardrobe tent. We just couldn’t shoot there anymore; and so we had to get the rest



Sequences set in Afghanistan and Pakistan were filmed on location in Morocco. For a scene in which Charlie visits an Afghani refugee camp on the Pakistan border, production designer Victor Kempster oversaw the construction of a partial set, populated with up to 800 Middle Eastern extras. In postproduction, Whodoo expanded the live-action scene for a long pullback shot in which refugees and tents extend to the horizon, tracking in a Roger Kupelian matte painting. To populate the scene, Whodoo rotoscoped vignettes out of live-action shots and added them to the matte-painted terrain. To fill out the backgrounds, Whodoo animated 3D characters and

of the refugee camp stuff back in California, at Mystery Mesa.”

vehicles, and added smoke, fire and flapping-tent elements shot at 4-Ward Productions.

At Mystery Mesa — a barren site frequently used by filmmakers — the art department built a city-block-square refugee camp set, which was populated with homegrown extras made up and bearded to look like the original Moroccan ‘refugees.’ The initial refugee camp shot starts on Tom Hanks in the foreground, then pulls back to reveal hundreds of thousands of displaced Afghans living in makeshift encampments and tents. “It is the greatest shot of a refugee camp ever done, I think,” said Edlund. “Tom looks around; and as he’s looking, we pull back and back and back, revealing people and tents going on to infinity. It is a very vibrant shot.”

Whodoo composited and animated a matte painting, multiplying the few hundred extras to hundreds of thousands of refugees, and extending the block-square set to an equal number of tents dotting the terrain all the way to the horizon. “It was a pivotal moment in the film,” observed Helena Packer, “where you literally see Charlie shifting his worldview. As the camera racks focus and zooms out, your focus shifts from Charlie in the foreground and at the center of attention to Charlie engulfed in the immensity of the camp. Because it was so important to the movie, it became a very scrutinized shot. Mike Nichols was very concerned, for example, that it didn’t become too generic as the camera pulled back. When you pull back from thousands of tents, at some point, everything just looks like topography. He was insistent that all the little vignettes of what was going on with the people register on the audience. So we played with the timing of the pullback and made it pretty slow at the beginning so that the audience would be able to see all of these people going about their lives in the refugee camp.”

Roger Kupelian’s final refugee camp matte painting was extremely detailed and dense, with a resolution that exceeded 8K. Once the matte painting had earned Mike Nichols’ approval, Whodoo lead compositor Mike Saz began overlaying it with three tiers of action. The first tier — closely surrounding Hanks and seen during the slowest part of the pullback — featured vignettes of refugee children being taught in a makeshift school, the wounded undergoing rehabilitation, a father talking to his son, and donkeys moving amongst the crowds. “To put the people in there,” noted Packer, “we searched through all the footage they had shot in Morocco and Mystery Mesa; and then we rotoed little vignettes out of those shots and put them in our matte painting. We animated some 3D people and some 3D cars for that, too, to fill it out. We also took all the tents that were shot and overlaid them in the matte painting — literally hundreds of tents are animated in that matte painting.” Whodoo also



Whodoo also animated a CG Hind helicopter – the Soviets’ most efficient killing machine – for shots the production could not obtain with real aircraft. To illustrate the Hind’s vulnerability after Charlie has arranged for the delivery of surface-to-air missiles to Afghanistan’s mujahideen

added smoke, fire and flapping tent elements shot at 4-Ward Productions. “The Skotaks set up tents and put fans on them on stage, so we could get variations of tent flaps moving.”

The second, midground tier of action was comprised primarily of animated tents overlaid on the matte painting. “It also had smoke that was shot,” said Packer, “some 3D smoke, and some real fire. And there is some animation, as well — some 3D people and 3D cars. That was all composited together. And then, the third tier, at the very far end of it, was just the matte painting. We didn’t animate that because we found that when we added animation to it, it didn’t look good. We did put some smoke drifting through it. By the time it was done, that was definitely one of the most difficult shots of the show — but it turned out to be one of Mike Nichols’ favorites.”

In addition to the refugee camp scenes, Morocco provided locations for shots of Afghans under siege by Soviet forces. “We shot second unit up in the Atlas Mountains for shots of mujahideen being fired on by the Russians,” said Richard Edlund. “We were in these little villages up in the Berber territory, which is between 7,000 and 9,000 feet in altitude. The interesting thing about shooting in this area of Morocco is that the color of the earth is very specific. There is a lot of iron oxide in it, so everything is salmon colored. As a result, there is a kind of reddish reflectivity from the ground, which causes a very interesting saturation in all of the colors.”

The flagship instrument of the Soviet attacks — the lethal Hind helicopter — is presented in the film as a malevolent, even evil tool of destruction. “The Hind is a horrible, ugly fighting machine,” Edlund observed, “rigged with rockets and armaments. It has a Gatling gun that fires tracers and explosives; and so, when the round hits something, it explodes. And when it hits a person, it blows them up — just obliterates them. It’s really vicious.”

fighters. Mike Nichols requested a visual effects shot of one of the choppers exploding in midair when struck by a missile. The shot featured Whodoo’s 3D helicopter in the moments leading up to the explosion, then cut to a 4-Ward Productions practical element. Whodoo also animated a CG Hind helicopter, the Soviets’ most efficient killing machine. For shots the production could not obtain with real aircraft, to illustrate the Hind’s vulnerability after Charlie has arranged for the delivery of surface-to-air missiles to Afghanistan’s mujahideen fighters, Mike Nichols requested a visual effects shot of one of the choppers exploding in midair when struck by a missile. The shot featured Whodoo’s 3D helicopter in the moments leading up to the explosion, then cut to a 4-Ward Productions practical element.

The first sequence to feature the Hind helicopter was dubbed the 'hose of death,' an apt description of the chopper's merciless and high-powered firing on a group of running Afghanis. The scene combined footage shot in the Atlas Mountains with physical elements tracked and composited by Whodoo EFX. "In Morocco," recalled Edlund, "we shot a real helicopter flying over a bunch of fleeing people. In post, Whodoo added elements that looked like meat flying off these people as they are hit, and explosive elements to make it look as if earth was flying up as the tracers hit the ground. The hose of death shot was a very complicated composite, with many, many elements."

At 4-Ward Productions, Robert and Dennis Skotak and their crew captured the pyrotechnic elements representing tracer hits and explosions, augmenting some live-action pyro work done on location by the special effects crew. "Live-action had done a flyover with the extras and smoke and dirt kicking up," noted Robert Skotak. "But they wanted a strafing run where you'd see the explosive hits on the ground. So, on our bluescreen stage, we set up a series of blue panels, each of which had eight to ten squibs planted in it, filled with cork, fuller's earth and dust. These were all hidden under blue aluminum foil 'skins' on the panels so that the charges wouldn't show until the actual detonation." Cameramen Dennis Skotak and David Hardberger captured the explosions of earth from a remote-operated high-speed camera mounted on an endless cable rigged 15 feet above the pyro charges. "We shot these passovers for a couple of days, shooting different size hits and traveling over them at different speeds and at several angles to create a variety of pyro elements. Then Helena and her crew tracked in those hits, placing them in the terrain as Richard Edlund wanted."

Whodoo also generated ordnance coming from the Hind. "We found real footage of the ordnance shot from a Hind," said Helena Packer, "studied it, and re-created it with animation. From this Gatling-type gun, the Hind shoots weighted 50-caliber bullets at a very high rate, and it has chemical-flurry tracers that are phosphorescent and evil looking. We re-created that look very successfully — but it is so high-tech and sci-fi looking, it's almost unbelievable, even when you are looking at it in raw, authentic footage." Packer and her crew also referenced war footage to create the look of bodies exploding for the hose of death shot. "It was just terrible, what we saw in the footage. People are shot with this thing and there is just nothing left of them. Mike didn't want blood and guts; but we did leave bodies here and there — even though, in reality, there wouldn't be



To capture the aircraft explosion, 4-Ward modelmakers Jim Towler and Lou Zutavern built multiple helicopter miniatures from detailed measurements and photographs of a real Soviet helicopter. Pyrotechnician Richard Helmer rigged the Hind models with explosive charges, and 4-Ward visual effects supervisor Robert Skotak and director of photography Dennis Skotak filmed the detonation from three camera positions simultaneously. Richard Edlund supervises as Helmer and effects assistant John Ziegler prep one of the Hind models for shooting.

a body left.” Whodoo 3D department head Terry Shigemitsu was responsible for re-creating the hose of death in 3D, and also did extensive work on the 3D Hind helicopter.

The Hind is featured a second time later in the film, after Charlie’s efforts on behalf of the Afghanis have equipped them with Oerlikon surface-to-air missiles capable of bringing down the armored fighting machine. Production shot plates for scenes of the mujahideen firing the shoulder-mount-launched missiles in Morocco and Mystery Mesa. Final shots employed both a miniature and a digital Hind. “We used miniatures for shots of the Hind blowing up,” said Liz Ralston. “Richard is a firm believer in getting what you can in-camera, and nothing beats a real explosion with parts flying all over the place. It starts off with a CG helicopter flying; and then there is a transition to the miniature right before the explosion.”

Whodoo built a 3D Hind from detailed specs provided by production, modeling it in Maya and applying textures derived from photographs of a real Hind helicopter. “We took about a thousand photographs of that real Hind,” recalled Helena Packer, “but then they repainted it right in the middle of everything! The Hind was one used in air shows, so it was really pristine and shiny — it didn’t look like it was in the middle of a war. So the art department aged it and dirtied it up, and we re-created that look in our 3D Hind.”

Whodoo used its 3D Hind to produce animatics demonstrating the trajectory of the helicopter up to the moment of the missile’s impact. Those animatics guided the filming of exploding Hind miniatures, four of which were built by 4-Ward modelmakers Jim Towler and Lou Zutavern. The miniatures were finely detailed, based on reference gathered from the pair of real Hinds production had procured. “We took all the measurements on the Hinds and photographed them inside and out,” related Robert Skotak, “taking note of the important, key details — stress lines, line work around the cockpits, quirky nooks and crannies that were a little ugly but gave them a real reality as opposed to a stylized reality. Then we built our miniatures in 1/7-ish scale. We built the original four, and then put the pieces of one back together after blowing it up so that we’d have a fifth — just to make sure we got everything we needed. All of the models were pretty well detailed, inside and out. We had photographs of the control panel, the instrumentation and all of that, so that we could re-create that inside the helicopters. We also had figures in there wearing helmets and flight suits. We even made sure they were wearing our best guess as to what their expressions would be when they realized they’d been hit! We never really see them from the front; but we put them in the cockpits, just in case. The plan was to do a hand-off from the CG helicopter to the exploding miniature — but we couldn’t guarantee that there wasn’t going to be some moment where you’d see the miniature in full; and so we had to completely detail it.”

The Skotaks rented a large bluescreen stage to shoot the exploding helicopters, with Richard Helmer executing the pyrotechnics. To capture a top view, side view and up-angle of the event, the 4-Ward crew shot each of the exploding miniature helicopters with three cameras simultaneously. “We were able to position the cameras so that we could shoot all of those at once,” related Skotak. “We had the helicopter on one mount, which was essentially a speed rail mount from a hard joint coming out of the lower passenger side. It veered away at an angle that hid it from all three camera positions.”

The Skotaks and their crew also generated vapor trails for the surface-to-air missile that impacts the Hind, using old-school ingenuity and Newtonian principles. “In recent years there have been requests by filmmakers to avoid particle animation for these kinds of things,” Skotak commented. “They thought it would look more realistic if we could physically generate a contrail or vapor trail for the missile. So I came up with an idea that I thought would be pretty easy to do. We took a three-foot-long plastic pipe of maybe three inches’ diameter, and we sealed it at one end with a cap with a tiny hole in it. Then we went up on a scissor lift in front of a bluescreen, filled the pipe with smoke, dropped it from the top of the stage and shot it at 120 frames per second with the camera turned sideways. So as the pipe fell, the air rushing into that little hole in the front forced out the smoke behind it. There was no propellant or anything. It was simply air and gravity making the smoke flow out of it. And that became the element.”

The film originally ended, as did the book, with the September 11, 2001, attack on the Pentagon — among the unintended but disastrous consequences of the United States’ funding of the mujahideen in Afghanistan. By the time the film had made its way through the editorial process, Nichols had opted for a different ending, one showing Charlie receiving his CIA honor at a small ceremony, with Joanne Herring and Gust Avrakotos among the attendees.

Despite its smattering of war scenes, Charlie Wilson’s War is more about interacting characters than warring countries, more about personal conflicts than national ones, more about small moments created by actors than large-scale pyrotechnic displays created by a visual effects crew. It is a ‘war picture,’ Mike Nichols-style. “In some ways, Charlie Wilson’s War wasn’t really Mike’s kind of movie,” Richard Edlund concluded. “He doesn’t do action movies. He’s great with actors and drama and sophisticated double-entendres. A war movie was different for him, and I was there to help facilitate the war parts of it. It’s the kind of thing I’ve been doing a lot of lately — doing effects for movies that aren’t really effects movies. I’ve done the space operas and the action movies; but it is much more fun to work with the likes of Mike Nichols and other top directors on non-effects movies. In those situations, I’m just there to facilitate the storytelling — and I really enjoy that.”

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Ground Zero

image

ARTICLE BY JOE FORDHAM

The mystery surrounding *Cloverfield* began to unfold for visual effects supervisor Kevin Blank, on location in Hawaii during production of the third season of *Lost*, when he received a phone call from producer Bryan Burk late one night in February 2007. “It was so secret,” recalled Blank, “they were not willing to send me a script. Bryan read the outline to me over the phone. He started at about 11 p.m., and it took an hour and 20 minutes.”

The story sprang from the imagination of *Lost* creator J.J. Abrams, who produced the project with Burk. Directed by Matt Reeves, with whom Abrams had collaborated on the TV drama *Felicity*, and written by Drew Goddard, another *Lost* alumnus, the film was a classic creature feature with a twist — a giant monster on the loose, seen entirely through the lens of a bystander’s handheld camcorder. The first-person narrative focused on Rob Hawkins (Michael Stahl-David), a young man on the eve of a career move from Manhattan to Japan whose personal relationships are torn apart by the cataclysm of a giant beast invading New York City.

Though the initial idea was to shoot the whole film with a camcorder, director of photography Michael Bonvillain ultimately used state-of-the-art high definition cameras for visual effects plates, including the Thomson Grass Valley Viper and Sony CineAlta F23. Bonvillain also used a Panasonic HVX 200 for the majority of the film to emulate lightweight handheld camcorder motion. With a total budget of \$25 million — a fraction of most modern effects extravaganzas — the filmmakers jump-started the production with a guerrilla-style shoot of a teaser trailer targeted to debut with Paramount’s summer blockbuster *Transformers*. Kevin Blank mobilized operations in Los Angeles, with visual effects producer Chantal Feghali, one month before the trailer shoot in New York City and Los Angeles. “I spent about a week looking into handling visual effects as we’d done on *Alias* and *Lost*,” said Blank, “with a small team of independent vendors. We also considered creating a visual effects facility to handle the work in-house. But it soon became clear that because the shooting style was going to be so ‘from the hip’ we had to bring in known effects houses with well-established pipelines to handle the schedule.”

The production recruited Double Negative and Tippett Studio, whose respective visual effects supervisors, Mike Ellis and Eric Leven, would share overall visual effects credit with Blank. Blank remained on the show through principal photography, overseeing the extensive plate shoot, then departed, leaving Leven and Ellis to work with Feghali on the complex postproduction effort. The Third Floor — under chief executive officer Chris Edwards and visual effects supervisor Nick Markel — created 3D animatics for the teaser trailer and main action sequences. The production also gathered samples of amateur camcorder footage of the September 11 terrorist attacks on New York City as a touchstone for shot design. “I particularly remembered one of the 9/11 home videos of the World Trade Center coming down,” recalled Blank. “As this big wall of dust came toward camera, the operator appeared to forget he was filming as he ran and hid behind a car; so all the camera saw was glimpses of a foot and a car tire, with the sound of the operator breathing — and it was

terrifying. That was the style of filmmaking Matt Reeves wanted to create. Visual effects delivered the payoff of the monster, but unlike *The Beast From 20,000 Fathoms* or *King Kong*, this film was not about the creature — it was more about the event.”

For principal photography, production designer Martin Whist staged a 24-day shoot in Los Angeles — on Paramount and Warner Brothers backlots and on soundstages at Downey Studios — followed by an eight-day shoot on locations in New York City. Matte painting designer Roger Kupelian at Fugitive Studios initiated designs for ruined city concepts. A team from Double Negative accompanied the shoot and drew on the company’s experience with digital city building to furnish set extensions to add to the New York and L.A. plates. “The thing that scared us most,” observed Double Negative CG supervisor David Vickery, “was the motion tracking. We tried as best we could to prepare for it, putting up hundreds of LED tracking markers all over our greenscreens. We surveyed sets with theodolites to create 3D surveys and spent months taking reference photographs on set. *Children of Men* had given us experience in how hard handheld cameras are to track; but populating entire scenes, adding to the foreground, midground and background, and making 3D stick to every area of a shot was very difficult.”

To accomplish the extensive tracking, Double Negative tracking supervisor Sam Schwier guided a small army of 25 matchmove artists working mostly in Science-D-Visions 3D Equalizer. Motion tracking was complicated by frequent use of in-camera zooms. “We looked into options for extracting encoded information from the zoom mechanism in the HD cameras,” said Mike Ellis, “but we didn’t have time or financial resources to make that work. Instead, we fitted a little lipstick camera to the camera, pointed at the zoom ring, and that gave our trackers an idea of the behavior of the zoom.”

Conceptual artist Neville Page, meanwhile, worked closely with J.J. Abrams to design the hyper-secret giant creature, known internally as ‘Clover’ though the beast officially remained nameless. Page developed a Clover maquette and also designed multi-limbed, crab/spider-dog parasites that live on the bigger creature’s body. Tippett Studio translated creature designs into articulated, keyframe animated creatures, adapting Page’s maquette from 3D renderings in Pixologic ZBrush. “We treated Neville’s ZBrush models as if they were scan data,” explained Eric Leven. “Our lead modeler, John Koester, rebuilt the models from scratch to take them into Maya. Neville had put the creature into a few poses by rotating joints around, and they were good starting points for us; but then animation supervisor Tom Gibbons and I figured out how this 350-foot monster would move. One of our concerns was that we didn’t want the creature to look like a man in a suit, even though it had two arms, two legs, a head and torso. So, we decided he’d walk on all fours, somewhat like an ape.”

Early concepts depicting the creature as an albino behemoth proved challenging. Placed in urban nighttime environments, punctuated by blinding blasts of military searchlights, the high-contrast skin design required careful texturing and lighting to convey the beast's enormous scale. "We made the creature translucent whitish gray," observed Leven, "but most of the movie was at night, so he tended to reflect the color of his environment and appear orange under sodium vapor lights or bluish under xenon light." Tippett art director Peter König and lead texture artist Gus Dizon developed battle injury looks, and detailed the creature with veins, broken blood vessels and barnacles. "The creature does spend some time in the ocean, and the barnacle encrustations were an indication that he may have spent some time on the ocean floor, but the producers wanted to keep its origins a mystery."

The creature first makes its presence felt when an explosion rocks Rob Hawkins' going-away party in Manhattan. Matt Reeves shot the party scenes on location in New York City using an HVX200 to cover all interiors and a Viper on a nighttime rooftop to cover views looking toward downtown, where a giant ball of flames erupts. For the teaser trailer, Hammerhead Studios generated the explosion by motion-tracking a 2D pyrotechnic element into the plate. For the main production, Double Negative generated a synthetic explosion. "We have a big pyro library now," said Mike Ellis. "In shots where we needed fires burning in the distance, we added 2D elements. For explosions close to camera or interacting in a particular way, we used fluid dynamic simulations."

A rain of fireballs drives observers to street level, where the decapitated head of the Statue of Liberty lands, raked with giant claw marks. Matt Reeves shot the sequence with tracking markers indicating the position of the Lady Liberty head on set and greenscreens at either end of the Paramount New York Street backlot set. For the teaser trailer, Hammerhead generated the head and set extensions as 3D models. For final shots, Double Negative built high-resolution set extensions and a highly detailed version of the head. "We had full-frame shots lasting 15 seconds on Liberty's eyes and nose," said Ellis. "The camera was right up close, revealing all the scorch marks, torn



New York City comes under attack from a giant monster of mysterious origins in Cloverfield. As conceived by producer J.J. Abrams, the film put a new spin on a genre staple by envisioning all action as seen through the lens of a bystander's handheld camcorder. Visual effects supervisors Kevin Blank, Eric Leven and Michael Ellis accompanied a guerrilla-style shoot in Los Angeles and briefly in New York, working alongside production designer Martin Whist and special effects coordinator David Waine. Tippett Studio then furnished animated creatures while Double Negative handled environment enhancements, including digitally decapitating the Statue of Liberty.

copper and smoke coming off it. The model had to be very high-resolution to withstand that scrutiny.”

To extend the environment, Double Negative built digital buildings using high dynamic range image surveys of sets and locations. “We built a number of generic buildings to fill out backgrounds between more distinctive structures like the Empire State Building and the Chrysler Building,” observed David Vickery, “which were built to higher resolutions. We then used our library of elements from World Trade Center — roads, street furniture, taxis, police cars — to fill out shots.”

The camera pans from the Lady Liberty head to the end of the street, where a colossal creature passes behind the Woolworth Building, which collapses in a massive pall of dust. The Woolworth Building collapse featured a digital set extension that Tippett Studio repurposed from its recent work on *Enchanted*. “We gave our Woolworth Building model to Double Negative,” explained Eric Leven. “They sent their matte painting back to us, and we animated and lit the creature in that environment. We sent rendered elements back to Double Negative and they did the final composite, controlling how much dust obscured the creature. Matt Reeves did not want to reveal much of the monster at this point — he just wanted to see a big thing moving through the frame.”

Double Negative generated a fluid dynamic simulation of dust and debris pouring into the street and a digital transition through the entry into a Bodega convenience store. The onlookers’ flight into the Bodega involved more than a dozen handheld camera shots that Double Negative sequence lead Ben Taylor blended digitally to resemble a single, long, frenzied camcorder take. “We had a lot of whip-pan transitions where the camera was moving very fast at the moment of the join,” said Mike Ellis. “We spent a long time rehearsing moves, and the cameraman lined himself up between takes so the beginning of one shot worked with the end of another. In a few cases, our transitions were simple mixes. In others, they were more elaborate,



The ground shakes as an enormous fleeting shape passes behind the Woolworth Building and demolishes it, sending a cloud of dust and debris toward terrified onlookers. Director Matt Reeves, director of photography Michael Bonvillain and the visual effects teams studied amateur camcorder footage of the September 11, 2001, terrorist attacks on New York City as a visual reference for the film, relying on similarly frenzied camera motion and glimpses of the city’s marauding protagonist to evoke an impression of cataclysmic events. The shooting style presented enormous tracking challenges to the visual effects team.



The production shot the Woolworth Building collapse on the Paramount Studios New York Street backlot set, where members of the visual effects crew placed tracking markers and greenscreens at either end. Double Negative surveyed the set with theodolites to create 3D surveys of the environment, and also shot high-resolution digital photographic surveys of the backlot set and New York City locations. Digital artists used that data to build CG set extensions, and used 3D geometry to create a fluid dynamic simulation of the debris cloud. Compositors layered all the CG elements behind the live-action crowd.

subtle morphs between shots, taking an element from one shot and tracking it to the next to make softer joins.”

With the camera inside, peering out, special effects coordinator David Waine’s team generated a practical dust cloud that obscured doors and windows. After sounds of thunderous footfalls pass by, the camera follows Hawkins’ brother Jason (Mike Vogel) out of the Bodega with a digital transition revealing a redress of the set, with flattened vehicles and dust-covered passersby flanked by shattered buildings, enhanced with digital extensions.

Hawkins’ group of friends — including Hudson Platt (T.J. Miller), who continues to record all that transpires on video — attempts to evacuate the city on foot via the Brooklyn Bridge. The production initiated the scene with location photography up to the bridge’s first stanchion. The remainder of the sequence was photographed with principal performers and 200 extras on a Downey Studios soundstage set consisting of a 150-foot-long boardwalk, 20 feet of handrail and one walkway lamp. “We couldn’t afford to build all the lamps,” observed Kevin Blank. “Instead, Michael Bonvillain set up lighting fixtures where all the lamps would be, and Double Negative added CG lamps and a high-resolution model of the Brooklyn Bridge.”

Double Negative built the digital Brooklyn Bridge using a commercially available lidar model as a basis for the structure, with photographic textures derived from aerial plates and three nights of HDRI location surveys. “I wanted to get a crane on the Brooklyn Bridge to shoot tile plates in both directions,” recalled Blank. “But we learned that *I Am Legend* had just done that, and the cost of putting the crane on the bridge had been way more than we could afford; so we ended up shooting aerial plates using a Wescam helicopter mount, and just tried to get as close as possible to the bridge.”

Sequence leads Victor Wade and Sean Stranks built the bridge in modular sections. Double Negative’s in-house digital asset system then generated resolutions as required by proximity to camera. “For the first 15 feet of walkway,” explained David Vickery, “everything in front of camera was at our highest resolution, with bevels on the edges of every nut on every lamp. The next level down used displacement maps instead of bevels; and the level after that didn’t have any nuts or bolts. That enabled our render farm to handle detail as the camera moved up and down the bridge, dynamically switching between resolutions.”

Hud’s roving camera pans and zooms back to the Manhattan shoreline where a crashed oil tanker — the source of the initial fiery explosion — lies beached. Double Negative generated the burning tanker digitally and detailed the ship with pyrotechnic elements and a ‘Tagruato Corporation’ logo — a fictional Japanese oil company conceived as part of the film’s online marketing campaign that hinted at the creature’s origins. Hud’s camera then pans and zooms to the decapitated Statue of Liberty. “Headless Liberty was a very simple shot,” said Mike Ellis. “We painted out the head in 2D, and they loved it! It became an iconic shot for the movie.”

A giant spray of water douses pedestrians on the bridge as a creature appendage swings into view and breaks the structure in two. The special effects team rigged practical water effects to rain over the crowd and create interactions with a Tippett Studio creature tail. Double Negative assembled the final composite.



As thunderous footfalls pass, the story's protagonists take refuge in a convenience store and then emerge -- camera still running -- onto the street, demolished in the creature's wake. The production staged the scene as a series of long, carefully choreographed takes darting into the store and then back out onto the redressed street. Double Negative generated invisible digital transitions between takes, using subtle morphs and tracking elements from one shot to the next. In addition to practical flattened vehicles on set, the ruined street featured digital set extensions and synthetic smoldering wreckage.

After the collapse of the Brooklyn Bridge, survivors take brief refuge in an electronics store where television screens display live news coverage of the creature rampaging through the city. Kevin Blank shot high-definition aerial footage over Manhattan. Tippett Studio tracked the creature into plates, keeping its anatomy obscure. "We had Clover standing and moving amid buildings as a gigantic mass," said Leven. "We used his little 'feeder' claws to disguise how many arms and legs he had, and used his tail to hide his face." Lead technical director Alfred Young and lighting director Steve Reding kept the creature shrouded using naturalistic lighting cues. "When this 350-foot-tall monster stood at street level at night, the 40-foot-high street lights only lit his feet. Past his ankles and his knees, we used building lights to cast a little ambient light on him, and helicopter spotlights illuminated portions of his body, keeping him a crazy, shadowy figure."

The creature rubs itself against buildings, dislodging parasites, which drop to street level and attack unlucky bystanders. Tippett Studio modeled parasites as Rottweiller-sized arthropods, with six fleshy legs and four attack claws. Gus Dizon used displacement maps to indicate parasite placement on the creature's body. Animators created keyframe motion cycles for parasites that swarmed across the creature, then animated clumps to drop and attack with manic intensity.

Hawkins and company head into midtown Manhattan in search of Rob's girlfriend, Beth McIntyre (Odette Yustman), but are caught in a skirmish between the creature and the U.S. Army. Matt Reeves shot the sequence with practical tanks and weaponry on the greenscreen-backed Warner Brothers New York Street set. Tippett Studio generated creature interactions, fusillades of gunfire and digital set extensions. Lead matte painter Bernhard VonZastrow used photographs of the set and locations in New York's Greenwich Village as textures, and extended buildings using simple 3D buildings and projected images. "The wild handheld photography meant the virtual set had to be much more of a 3D environment instead of a typical 2D matte painting," explained Leven.

Seeking refuge in a subway station, Hawkins and his friends proceed on foot through a darkened tunnel. The production filmed the sequence in San Pedro, California, in a railway cargo tunnel previously used in episodes of *Alias*. Animal wranglers provided trained rats to scuttle past the actors' feet, and Tippett Studio enhanced the vermin swarm with 3D animated rats.



Venturing uptown in search of a lost friend, Rob Hawkins (Michael Stahl-David) and Lily Ford (Jessica Lucas) halt in shock as they discover the north tower of the Time Warner Center half-collapsed and leaning against its neighboring tower. The visual effects crew shot airborne helicopter plates of Time Warner Center, but security restrictions limited access to the surrounding area. Double Negative digitally removed the existing tower from plates and reconstructed the environment using digital stills of the area, then layered in smoke and atmospheric effects.

Hud then activates the camcorder's night vision to reveal three parasites with shining eyes advancing across the tunnel ceiling. Creative Character Engineering animatronic supervisor Andrew Clement provided practical parasite puppets with mechanized jaw and claw action for on-set interactions, but the chaotic nature of the scene and the violent creature interactions resulted in an all-digital approach. "We discussed building stunt rigs for actors to push or kick," said Leven, "but like the animatronic puppets, we saw too much of the rigs because the camera was swinging all over the place. Instead, the stunt coordinator placed mats on the floor, and the actors threw themselves down and writhed around as if there were parasites attacking them." Tippett Studio placed LED markers in the tunnel to assist motion tracking and directed actors' eye-lines and body language to help integrate animated creatures.

Marlena Diamond (Lizzy Caplan) receives a parasite bite to the shoulder, which proves fatal as a hemorrhagic infection causes her torso to explode at an Army triage center. Andrew Clement's team created Marlena's deterioration first as a silicone prosthetic makeup applied to the actress' shoulder, and then created a practical erupting effect played in silhouette behind a hospital curtain. Double Negative distended the abdomen in 2D and treated the explosion to minimize the shocking spray of blood. Creative Character Engineering also supplied prosthetics for other trauma victims in the Army hospital — filmed in a shopping mall in California — and a dead parasite seen fleetingly on a gurney.

Outside the hospital, survivors emerge onto Columbus Circle where they observe Beth's apartment building, the north tower of the Time Warner Center, half-collapsed and leaning against the neighboring south tower. Kevin Blank shot helicopter plates of the Time Warner Center; but the surrounding area, in the vicinity of Columbus Circle, was a strictly enforced no-fly zone that precluded photographic access of the building's environs. Double Negative instead used digital stills of the area, taken from a high vantage point, projected city textures as a digital cyclorama surrounding the greenscreen rooftop set, and extended the roof with teetering CG air conditioning units, flames and sparks to increase the peril of the scene. Tippett Studio added the creature below, being strafed by F-18 Hornet fighter jets, and generated the creature in a subsequent scene as Hawkins and his friends run along Park Avenue, guiding rescued, but gravely injured Beth to a helicopter evacuation point. "As they ran past Grand Central Station," said Blank, "the camera

looked up, and towering behind them was the Chrysler Building and a glass-exterior hotel building that Clover smashed through."

Reeves filmed the street run in New York. Tippet Studio integrated the giant beast tearing through the building using an EarthData lidar model of the location. "The lidar data was low-rez," commented Eric Leven, "but for the scale we were working at, it was all we needed. We animated Clover getting shot, turning to face the guys shooting at him, and then putting his head through the building." Tippet effects lead Joseph Hamdorf and his team smashed apart the building digitally. "It was like rigging a miniature to smash apart with multiple layers of debris, except we did it in CG. We had glass bouncing off the monster's body, crashing to the ground, clouds of dust, rocket launchers, explosions and tracer bullets."

The helicopter airlift from 40th Street and Park Avenue featured New York location photography that transitioned to a digital set extension shot in Los Angeles. "As we got to 40th and Park, they were running in New York," said Kevin Blank. "The camera tipped up to see a helicopter fly overhead. When it tipped back down, we were in Downey at our virtual 40th and Park." Double Negative sequence supervisor Bronwyn Edwards supplied digital environment extensions seen from the ascending helicopter.

Matt Reeves shot actors inside the helicopter on a greenscreen set in Downey. For views of Manhattan below, the production shot a high-definition tiled plate array using two Viper cameras pointed out the side of a helicopter and two CineAlta F23s angled forward. Tippet Studio then blended plates, catering to wide-angle lens distortion and perspective shifts between cameras, building a 3D version of the environment by projecting footage onto multiple image planes. Matchmove supervisor Devin Breese then ran the imagery through a 3D camera move to create a 40-second camcorder point of view out the window that panned back and forth from the cabin to the creature below as a B-2 bomber attacked. "We had to destroy ten blocks of Manhattan," explained Eric Leven. "When we first saw the plates, we calculated that it would take one artist an entire year to do this! But our compositing supervisor, Chris Morley, made it work with dozens of artists on the shot."



From atop the collapsed Time Warner tower, Rob, Lily and cameraman Hudson Platt (T.J. Miller) see the 350-foot-tall monster approaching, lit by incendiary flashes of U.S. Army ordnance. To preserve the mysterious nature of the unnamed and largely unexplained creature, Tippet Studio revealed it only sparingly and in poses designed to disguise its anatomy as it navigated the skyscraper canyons of Manhattan. Environmental lighting elements – such as roving searchlights, strobing tracer fire and flames – were reflected in the creature's pallid skin.

Tippett Studio animated the beast being strafed by explosives and then swiping at the helicopter. “The sun was coming up in shot so we made a matte painting to show the ruined distant city,” said Leven. “We animated the B-2 flying in, dropping bombs, destroying buildings and shattering windows. As Clover was hit, he threw out his arm in a last-ditch effort to keep his balance, smashing the side of a building, and then he fell into a gigantic cloud of smoke.” Chris Morley’s team combined fluid simulations of smoke and fire with a vast number of 2D elements. As the shot moved back to Rob and Beth, compositors added digital rotor blades and flickering light effects to angles of the cabin. The camera then panned back to smoke below as Hud prematurely celebrated the creature’s demise. “This was our big *Jaws* moment. We animated a huge shadow coming up through the smoke; then Clover smashed up into camera and took the chopper down.” Double Negative created the helicopter crash — swirling backgrounds flashing past windows — using aerial plates of Manhattan composited into greenscreen helicopter interiors, with camera shake and motion blur effects.



As Hud’s handheld camera pans up from street level, the creature lurches into view above Grand Central Station, angered by a ground-level artillery assault. Starting with a live-action plate shot on location in New York, Tippett Studio animated the monster’s reactions to gunfire hits, and its subsequent crashing through a glass-fronted building. Tippett Studio digitally simulated the creature’s interactions with the building environment, rigging 3D models with interior furniture that could smash apart dynamically and rain debris across the creature’s body.

On impact, the camcorder glitches and continues running, canted on its side as Hud and Beth pull Rob from the wreck in Central Park. The production shot the scene on a patch of grass in Downey backed by bluescreen, into which Double Negative composited distant trees and a smoldering New York City skyline. Hud retrieves the camera, which then tilts up to a show-stopping view of the creature. The entirely CG shot revealed the creature’s four-way jaw mechanism, flaring nostrils, nictitating eye membranes and pulsating ear membranes on either side of its head. “Phil Tippett suggested that shot to J.J. and Matt Reeves,” recalled Leven. “Clover was catching his breath. He wasn’t beaten or downtrodden, he was considering Hud, and it gave us a chance to show how the creature breathed and moved — and then he lunged at camera and ate him!”

Tippett Studio created a digital double of the lower half of actor T.J. Miller’s body, which caught in the monster’s teeth as the jaws chomped down. Andrew Clement’s team created a severed upper-torso likeness dummy of Hud to fall to the ground. Both are seen in fleeting frames that tumble into a closeup of Hud’s face lying in the grass as he expires, the camcorder auto-focus twitching. Sound effects then imply a military air strike, played off camera as Rob and Beth take refuge in a pedestrian tunnel. “We shot the scene with Rob and Beth in a tunnel in Central Park as everything was exploding,” said Kevin

Blank. “We then cut to a piece of footage, supposedly already on the tape, that was being recorded over, a non-linear glimpse of their relationship with them previously happy in Coney Island. Then it ends and the implication is everybody dies.”

During postproduction, Double Negative added a subtle enigmatic detail to the Coney Island scene, compositing the splash of an object landing out in the ocean, visible to frame right of the scene. The puzzle box of plot points, coupled with a nontraditional narrative structure, deliberately left the creature unexplained, a completely malicious entity. “In most giant monster movies,” observed Leven, “the story ends up in the Army command center, with scientists trying to figure how to nuke the creature, and we feel sympathy for the creature. This movie was different because we stay with, and we sympathize with, these young human characters as they lose their friends and family. The monster was a big rampaging beast, and we never get a chance to think of it as a sympathetic character.”

Technically, the project broke down into 163 visual effects shots, with Tippett Studio producing ten and a half minutes of character animation in 16 weeks, and Double Negative generating 35 minutes of screen time, 22 minutes of which were large-scale digital environment enhancements. Successful completion of the work was made possible by open communications between filmmakers and effects teams. “We planned as best we could in the most cost-effective way,” concluded Mike Ellis. “We pushed ourselves and tried to get the best out of our people in the shortest amount of time. It was hard work, but it wasn’t grueling. We had a good dialogue with Matt Reeves, Kevin Blank and with Tippett Studio. We hit the ground running, and it came together because we had very experienced crewmembers who knew exactly how to handle the work.”

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The next morning, after dropping his camcorder in Central Park, Hud swings the retrieved camera skyward and is momentarily transfixed by the sight of the creature staring directly back at him, considering its prey. Tippett Studio founder Phil Tippett suggested the moment to J.J. Abrams and Matt Reeves, extending what had hitherto been planned as another fleeting shot into a show-stopping closeup of the creature, revealed through a soiled camcorder lens. Tippett Studio generated the 40-second shot entirely digitally, showcasing the creature’s bizarre physiognomy, which included alien ocular mechanisms and pulsating bladders on either side of its head.

The First Hero

image

Article by Jody Duncan

In Roland Emmerich's 10,000 B.C., mysterious warlords raid a peaceful mountain village and take its tribe members captive. Left behind is D'Leh (Steven Strait) who sets out with a small band of hunters to find and rescue the kidnapped villagers, including his love, Evolet (Camilla Belle). Their trek to the other side of the world leads them to the discovery of a civilization dominated by a self-proclaimed god, in which hundreds of thousands of enslaved people and beasts labor to construct the pyramids at Giza.

Realizing this 12,000-year-old world — populated with now-extinct wildlife such as mammoths, saber-tooth tigers and terror birds — required a large-scale visual effects effort, initiated by visual effects supervisor Karen Goulekas and visual effects producer Mike Chambers in April 2005, nearly three full years prior to the film's release. "We were breaking down the script and coming up with a budget and a plan," said Karen Goulekas. "And then the movie got greenlit in August, and we took off for London, which was going to be our home-base for the effects work." Goulekas, Chambers and Emmerich awarded the bulk of the show to U.K. effects powerhouses Double Negative and The Moving Picture Company, which completed approximately 150 shots each. With 104 and 105 shots respectively, Machine FX and The Senate contributed significantly to the film, as well, as did an in-house production effects team of eight to ten that executed composites for 192 shots.

To develop early concepts for the show, the filmmakers engaged Patrick Tatopoulos, of Tatopoulos Studios, to render sketches and build scaled models of the main creatures. Gentle Giant Studios scanned Tatopoulos maquettes, providing the visual effects vendors with data from which to begin building models for previz and effects shot purposes.

"Roland came to me about six months prior to shooting for 10,000 B.C. and said that they needed mammoths, a saber-tooth tiger and a giant bird," Tatopoulos recalled. "He said, 'We can do research and look at books to get ideas for these things; but I also want to change them a bit for the movie.' And that's where I came in. He wanted creatures that looked natural and real, but with a bit of a twist to them."

For the mammoth, Emmerich wanted an animal that looked less lumbering and slow than scientific evidence suggested. To satisfy that brief, Tatopoulos and his artists slightly altered the mammoth's proportions and skeletal structure. "We looked at real mammoth skeletons and at scientific drawings of mammoths and elephants," Tatopoulos noted, "but we went off from there. In our drawings, we changed the proportions to make them more bull-like, which made the mammoth look more powerful and menacing. Then we looked at the science drawings again to make certain that, even with our changes in proportions, everything on the animal was as realistic as possible."

Tatopoulos sculptor Glen Hanz interpreted concept sketches in a two-foot-tall mammoth maquette, which was then molded so that the crew could create a final painted model complete with silicone skin and fur. "The silicone skin gave us the transparency we wanted," said Tatopoulos, "and allowed

us to punch hair on the model. Because of the scale of the model, we had to use extremely fine hair. Yak hair was too thick; and so we used a combination of synthetic hair and hair from other animals.” Concept artist Robert McKinnon did 2D Photoshop renderings to explore paint schemes — subsequently executed by Lennie MacDonald on the mammoth model — and Ned Neidhardt took charge of the hair-punch work. “What we had at the end was a scaled dummy that they could drop on location and light.”

Tatopoulos also contributed early concepts for the saber-tooth tiger, which would figure prominently in two sequences. Artist Tully Summers sculpted a hairless version of the large cat, maintaining very lean proportions in the sculpt to allow for the thickness of a rabbit pelt that would be applied to the final model in lieu of punched hair. That pelted model was then painted and detailed.

In developing concepts for the 12-foot-tall terror bird, Tatopoulos and his artists combined features of two real birds that existed thousands of years ago. “What we wanted for the terror bird was a fighting creature,” said Tatopoulos. “It had to be big enough to fight humans, so it had to be at least six feet tall. We combined the body of one type of bird, which was very much like an ostrich, and the head of another bird, which had a very powerful jaw and beak.” The final terror bird model, sculpted by Bruce Spaulding Fuller, sported small wing-like appendages with lethal claws at the ends and real fur and feathers applied by artist Jeff Himmel. Tatopoulos artists also created concepts for a vulture that appears in the saber-tooth tiger sequence, as well as a rhinoceros and a plated, armadillo-like creature, both of which were dropped from the script prior to filming.

While Tatopoulos artists developed creature concepts in Los Angeles, Karen Goulekas and Mike Chambers searched for a London-based previz team, finally hooking up with Nvizage, a five-year-old previz company founded by Mill Film veterans Nic Hatch and Martin Chamney. The previz team would find 10,000 B.C. to be unlike any other project. “10,000 B.C. was an atypical situation in that it was such a huge amount of work to take on,” Martin Chamney observed. “It required that we completely change our mindset, really. They wanted quite a lot of detail in their previz; and so we had to think of ourselves almost like part of the visual effects pipeline, rather than just rapid-fire previz. We had to set up a robust, long-term pipeline in order to get through this project.”

“We had a much bigger team than we would normally have, too,” said Nic Hatch. “It went up to about 20 people at one stage — all doing previz. Normally in previz, everybody does a little bit of everything. They are 3D generalists. This time, we had specific roles for people to handle the detailed creature animation. We had modelers, texture artists, 3D riggers and animators, just like a visual effects pipeline. But we still had to work fast; and so we set up what we called ‘real-time previz.’ We wanted to do animation of a mammoth and a human being, and then press ‘play’ and see that animation happening, real-time. We didn’t want to have to render anything. The previz was still quite detailed, but we used game engine technology, within Maya, to make sure we could get this real-time situation. Every artist could see their work very quickly, without waiting for the computer to process things.”

The team prevized all the big effects sequences, beginning with the mammoth hunt that opens the movie. The hunt was one of the few sequences that had been storyboarded; but by the time the previz work started, Emmerich and co-screenwriter Harald Kloser had made so many changes to the script, the storyboards were no longer relevant. “For most of the previz,” observed Karen Goulekas, “we just went off of nothing. I would talk through the script pages with Roland, break everything up into beats, and give those beats to the previz artists with the idea of blocking the overall action from a bird’s eye view. Once we had that, we started animating cameras. The previz artists sent camera angles to me — over-the-shoulder shots, crane shots — and we started cutting the sequence together with visual effects editor Steve Pang.”



In director Roland Emmerich’s 10,000 B.C., mammoth hunter D’Leh (Steven Strait) sets out on a quest to rescue kidnapped tribe members when his mountain village is raided by mysterious warlords. To populate the ancient world with now-extinct beasts such as mammoths and saber-tooth tigers, Emmerich and visual effects supervisor Karen Goulekas engaged London-based effects houses The Moving Picture Company and Double Negative. The Senate and Machine FX also made significant contributions to the show, as did previz artists from Nvizage and a production-side visual effects team.

Data from the previz files guided the filming of plates when the shoot commenced in April 2006, in New Zealand, where much of the mammoth hunt was shot. Production then moved on to South Africa and Namibia. “The story demanded remote, untouched locations,” stated Mike Chambers. “It was also favorable, from a budget standpoint, to shoot in some of these locations. Of course, there were problems, too. There isn’t the infrastructure you need for production in places like that, so you have to bring everything in.” Chambers left the production midway through the shoot, due to family issues that required his presence back in the United States, and was replaced by visual effects producer Barrie Hemsley who saw the show through to its completion.

With the filmmakers at the New Zealand, South Africa and Namibia locations were five members of the previz team and a compositor, all engaged to produce ‘post-viz’ imagery that could be cut into the film. “We also had one MPC artist who was there working on run and walk cycles for the mammoths,” observed Karen Goulekas. “This team created post-viz by taking our previz assets and tracking the cameras and putting them on the plates that we were shooting. It was great, because when we had it all together, we could hand it over to the vendors and say, ‘Here’s the sequence.’ The vendors pretty much stuck to that post-viz, with just a few tweaks here and there. The only exception was Double Negative, which did their own post-viz for the tiger and terror bird sequences.”

“Post-viz can be compared to temps,” added Martin Chamney. “The idea is that you do a very rough track and add CG assets to the plates to see if there are any problems with the shots and layouts. It can be done quickly and efficiently because it is a very rough track. A postproduction facility, of course, is not interested in doing a rough track — it would be a waste of their time. But we can do that, and it helps the director assemble his movie. It gives him continuity.”

Continuity was also a consideration when some of the Nvizage previz and post-viz animators moved over to Double Negative and The Moving Picture Company for actual shot production. Previz artist Rob Hemmings became the animation supervisor at Double Negative, while artist Greg Fisher served as MPC’s animation supervisor. “By that time,” Goulekas said, “I’d been working with these guys for a year, so we spoke the same language and they knew exactly what we wanted. It was fantastic to be able to stay with them and have them lead the way through shot production.”



The film opens with hunters agitating a mammoth herd into stampede. Emmerich shot much of the mammoth hunt sequence in New Zealand, then moved on to Namibia and South Africa for the remaining weeks of principal photography. The Moving Picture Company added mammoths and interactive effects to the production plates. MPC built a mammoth computer model that was relatively smooth-skinned – incorporating deep wrinkles via displacement maps at render time – then engineered a new dynamics system to simulate the animal’s long, thick fur. Animators based mammoth behavior on elephant reference captured at London Zoo and at a South African game reserve.

The film opens with D’Leh and his fellow hunters agitating a 300-strong herd of grazing mammoths into a stampede, and then bringing one down with a giant net. MPC on-set supervisor Matt Hicks accompanied production for the mammoth hunt shoot in New Zealand, while Gary Brozenich supervised at the Namibia location where the second half of the sequence was shot. Plates captured at both locations were a combination of helicopter footage and low cameras angled upward to frame the mammoth that MPC would computer generate and track into the scene.

In postproduction at MPC, the mammoth design evolved significantly from the initial Tatopoulos concept. “We spent nine months rebuilding the mammoth from scratch,” said MPC visual effects supervisor Nicolas Aithadi, “just because it changed so much from the original design. The body proportions, the length of the legs, the shape of the ears — everything changed.” The mammoth computer model — rigged and modeled under the supervision of Tom Reed and Andrew McDonald, respectively — was relatively smooth-skinned, with deep wrinkles incorporated through displacement maps at render time. “We based the mammoth skin on photographs of elephant hides we had taken at London Zoo. Rather than model the folds and creases, we spent a lot of time with ZBrush, creating displacement maps from the photographs that could be animated dynamically.”

The mammoth feature that presented MPC with its biggest challenge was the creature's long, thick fur. The company worked for six months building a new fur system that could simulate — reliably and quickly — 1.5 million hairs per mammoth. "The hair on the mammoth measured two meters long," said Aithadi. "That was very long hair to deal with, and the longer the hair, the more vertices along the hair. The more vertices, the more likely you'll have complications. We had to come up with a fur system that could handle that kind of length. Once we did that, we needed to make sure that we could render a hundred mammoths — with fur — for shots of the entire herd. The renders were insane when we started; but we managed to trim them down. We wound up with acceptable render times — between three to six hours per frame for some shots. Other shots were much longer, because instead of having one hero mammoth we had ten hero mammoths — and we had to multiply render times by the number of mammoths. One shot took a full week to render."

MPC also came up with a procedural approach to adding clumps of dirt and mud to the fur. "That was actually one of the trickiest things to do," said Aithadi. "Without the dirt and debris, the mammoth looked like a creature that hadn't been in makeup yet. To make it look more like an outdoor, natural creature, we had to add a tool to the system that would attach pieces of mud and grass to the fur, creating them as objects that could be spawned at the tip of each hair. We had maps defining which area of the mammoth had more mud or grass; and then these objects were generated in those areas. It helped make the mammoth look more realistic." As head of MPC's texture department, Alban Orhiac took the lead in developing overall mammoth textures. "Because of the closeness of the shots, we had to have extremely detailed textures. Between color, displacement, specular and other attribute maps, we ended up with 650 texture maps painted for the mammoth."

Like the skin textures, much of the mammoth animation was based on elephant reference that had been captured at London Zoo and by an HD video crew at the Tala Game Reserve in South Africa. Elephants provided excellent one-to-one reference for basic mammoth actions. "For shots of mammoths walking and grazing," explained Karen Goulekas, "I just had the animators rotomate to the reference footage of elephants we had shot. We got all the walking, grazing, head-twitching, ear flicking from that. The one thing that elephants don't do — and which Roland wanted the mammoths to do — was gallop. We had reference of elephants running, but they don't really run — they just walk fast." The idea of a galloping mammoth had been inspired by the 1962 John Wayne film *Hatari!*, in which a rhinoceros charges a jeep in full gallop. "We loved the look of the galloping rhino; and so in previz, Rob Hemmings came up with this gallop cycle for the mammoth, and we



The hunters approach the mammoth they have captured in a giant net made of mammoth fur and bones. Performers handled a practical net on the set, but MPC had to re-create the prop digitally for interaction with the CG mammoth. To model the net, MPC devised a tool inside its new fur system to twist mammoth hair into rope-like cord. Interaction of the fur net with the thrashing, furry mammoth was extremely complex, involving millions of individual hairs.

gave that to MPC. Roland fell in love with it — but, of course, it's the kind of thing that drives animators crazy."

The problem facing MPC's animation team was that the mammoth's anatomy did not at all lend itself to a gallop. Whereas an animal that large typically has at least one foot on the ground at all times when running, a gallop is a series of long strides, in between which the animal is airborne. As conceived in the film — and in reality — the mammoth would have been much too large and heavy to execute that kind of acrobatic lift, and its bones would have broken with the impact of its weight landing with each stride. The incongruity of the behavior and physiology led to MPC's spending many months developing and tweaking the mammoth gallop. "These animals were supposed to be something like 18 feet tall," observed Greg Fisher. "Making that massive a creature look natural while doing a gallop that didn't really fit its physiology was extremely challenging."

Once MPC had completed the first round of animation, the team ran muscle and fur simulations. The latter often resulted in a need for additional keyframing. "We'd animate the creature and do the muscle simulation," stated Nicolas Aithadi, "and it would do all kinds of cool stuff — but then we'd apply the fur, and we would get strange jiggles on the fur we hadn't expected. So we would have to go back a little bit and fix those things. It was a learning process. As we went along, we figured out what caused those problems and how to avoid them."

On location, production had shot hunter performers handling a real net; but interaction between the net and the mammoth called for a computer generated version of the prop. Though the net was a seemingly small CG problem — at least as compared to the mammoths — it became one of the most difficult elements of the hunt sequence. "The main issue," Aithadi said, "was that the net was made of the hair and bones of another mammoth that they had killed before. So we had to model a net made of fur and come up with a tool inside the fur system to make the hair twist around the net rather than hang vertically from it. The net actually had more fur than the mammoth, because of the way the hairs were twisted around to create this kind of rope. Then the net had to interact with the mammoth — so we had fur from the net interacting with fur on the mammoth. That was very complex, involving millions of hairs interacting together."

MPC worked from photographs of the on-set net, using them for textures for longer shots. Closer shots required the full fur simulation. "In some shots we were extremely close to the net and the mammoth," said Aithadi, "and we had to groom the net to make it read as fur. Also, when the mammoth is caught and struggling in the net, we had to create all of the debris and hair that falls



Tatopoulos Studios supplied creature designs and models early in the show's preproduction — although those designs evolved considerably at Double Negative and The Moving Picture Company. For the mammoth, Tatopoulos artists developed concept sketches, then sculpted a two-foot-tall maquette. From that maquette, the crew created a final painted model complete with silicone skin and punched hair. Prior to a photo session, Tatopoulos artist Ned Neidhardt finishes the hair work on the mammoth model.

from it.” Greg Fisher’s animation team animated the net by hand, initially, just to block out the action. Final shots were done dynamically, with a bit of keyframe tweaking to refine the simulated action.

To suggest interaction with the environment, MPC modified its fur system to generate a grassy terrain, ultimately replacing approximately 90 percent of the grass that was in the plates with CG grass to avoid the labor-intensive rotoscoping that would have been required to place mammoths into the environment. “In most of the shots,” said Aithadi, “we had to remove the grass completely and then grow CG grass on top. In some of the shots, the only thing that was real were the hunters — everything else was CG.”

In two shots of D’Leh running alongside a mammoth within the herd, even the human character was computer generated. “No human being could really run that fast,” noted Aithadi. “So, for that, we had to do a CG character running alongside the mammoth. We had some apprehension at the beginning about doing this because it was a full-frame CG character, bare-chested. But it was very well done.” MPC modeled the CG character from cyberscans of the actor, applying textures from digital photographs the crew shot on set. “We had to create a full muscle system inside the body because traditional skinning and rigging wasn’t detailed enough for a full-frame character. We had to have jiggle in the pectorals — everything needed to move at that distance.” MPC wound up creating 18 computer generated puppets for the show — digital doubles of all the hero characters, plus several generic characters for crowd scenes.

MPC added layers of atmospheric effects to the mammoth hunt shots, such as huge clouds of dust stirred up by the running beasts. “We ate a lot of dust on this picture,” quipped Aithadi. “These creatures are so big they would naturally create a lot of debris and dust when they ran, so we had to add all of that to the plates. We wound up cutting back on that a bit, though, because if the dust and dirt were too heavy you couldn’t see anything. Even so, all of our shots had enormous amounts of effects. We had flying dust, grit, bits of torn-up grass — everything around the mammoth was moving.”

Machine FX provided additional environmental work for the mammoth hunt. Led by supervisors John Lockwood and Steve Street, Machine artists created matte paintings to augment a long panning shot that establishes the setting. “It was mainly a continuity and look issue,” observed Steve Street, “in that there wasn’t any snow on the ground in the plates. They had shot it with no snow initially; but as the show developed, they decided they wanted to change the look of the setting a bit, as well as change the look of the mountains in the background. Also, the skies were not consistent in the live-action plates.”

“Due to perspective shifts in the panning shot,” John Lockwood elaborated, “we had to create a 3D matte painting to add the patches of snow and make the whole thing look more wintry on this moving, existing plate. We 3D-tracked it, and then we projected the painted elements onto a 3D topology of the shot.”

The Senate contributed a digital makeup effect conceived in postproduction to help distinguish a main character, Ka’Ren (Mo Zinal) — whom Roland Emmerich named in homage to his longtime collaborator, Karen Goulekas — from the other mammoth hunters. “During the hunt,” explained Senate visual effects supervisor Richard Higham, “Roland felt that Ka’Ren was not standing out from the rest of the guys — and particularly not from D’Leh. So we were asked to come up with some kind of face paint design. I had several of our Shake artists come up with different designs and we presented them to Karen and Roland.”



In search of captive tribe members, D’Leh and his small band of mammoth hunters take refuge in a lush jungle where they encounter 12-foot-tall ‘terror birds.’ Double

Goulekas and Emmerich selected a design that resembled a handprint. “It looked as if someone had pulled three fingers right across the eyes and then down onto the face,” Higham noted. “I knew that one looked the best; but I was worried about it because there were so many shots that had the character turning his face, running around, pulling close to the camera, et cetera. I thought it was going to present a lot of problems. We only had a few weeks for this whole sequence, and so I knew we weren’t going to be able to do a full-motion CGI rig. We would never have been able to track that accurately in the time we had — it would have slipped all over the place. So, instead, we did two-point, three-point and four-point tracks. We tracked to anything we could find — a slight blemish on his face, anything like that.” A rough 3D model built from production cyberscans of Zinal also guided artists. “We applied the face paint design to that 3D model, just as reference. We had it rotating around so the artists could study it. That way, they could see what the design on the face should look like at various angles. They copied that look as best they could, tracking it in. Sometimes the track worked straightaway; other times it took up to a week to get it without slipping. Still, by doing it 2D and using a four-point track, we were able to emulate 3D fairly quickly, just tweaking it afterwards with a few warps here and there.”

The Senate’s face paint design made its way into a bluescreen scene shot late in the post schedule. “Roland wanted to emphasize the relationship between Ka’Ren and D’Leh and the conflict that had always existed between the two of them,” explained Higham. “So they decided to shoot this ‘boy fight’ scene. It starts with a bunch of kids, including Ka’Ren as a boy, practicing spear throwing. And then D’Leh comes along and tries to join in, and they end up in a bit of a scrap. They did this scene subsequent to all the mammoth hunt stuff, and we were already delivering some of our face paint shots. So, prior to shooting the scene, they actually drew the face paint design onto the face of the child actor playing Ka’Ren. In this instance, the visual effects informed a subsequent shoot. We felt quite proud of that.”

The next major effects sequence after the mammoth hunt is one in which D’Leh and his fellow tribesmen hide from a warlord and his men in a jungle, only to be attacked by giant terror birds. A Machine FX environmental matte painting established the jungle valley. “That was a big shot,” noted John Lockwood, “because it needed flows of subtly moving mist on the floor of the valley. We added some CG birds in the shot, as well, to give it a bit more life.”

Negative produced the terror bird attack shots, first building a computer model of the ostrich-like predator based on Framestore CFC concept art. To generate terror bird feathers that resembled ostrich plumage, Double Negative wrote a separate feather tool that worked with its established fur system. Double Negative also laid in multiple layers of fine skin textures on the bird’s head and neck to ensure that bald areas would appear photorealistic in closeups.



Double Negative developed fierce combat behaviors for the terror birds, and composited the animated creatures into jungle environments simulated on stage or captured on location in South Africa. To place the digital birds into live-action scenes, Double Negative first painted out terror bird ‘stand-ins’ – performers in blue bodysuits, holding sticks with beaks at the ends – then executed extensive rotoscoping within the plate foliage.

Nvizage and Karen Goulekas had thoroughly prevized the terror bird sequence, and had included in that previz a detailed CG environment. Emmerich so liked the previz environment he had elements of it re-created in the practical set. “We had also let the previz animators go to town coming up with sight gags for the terror bird attack,” recalled Goulekas. “They had tree branches snapping and falling on the birds, rocks hitting the characters. It was really a fun sequence to previz; but, of all the sequences, this one changed the most from previz to final shots, just because the gags and the choreography of the attack were so intricate.”

Nicolas Aithadi was on set in South Africa for filming of the terror bird sequence since it had, initially, been awarded to MPC. But MPC’s expanding workload led to terror bird shots being transferred to Double Negative’s slate, with visual effects supervisor Jesper Kjölsrud overseeing the project. Double Negative did its own post-viz for the sequence, sending shots to Goulekas on location throughout the shoot.

The final sequence has about a dozen of Double Negative’s CG terror birds revealed in long shots, with two of the creatures more prominently featured in the attack. Double Negative started with concept art that had been developed by Framestore CFC during the film’s prep period. “That concept art manifested itself in some drawings,” recalled Double Negative CG supervisor Alex Wuttke, “and we used those drawings as the basis for our terror bird. We did a little bit of work with color as the show progressed, playing with beak color and feather textures; but, overall, the look of the bird was very similar to the original concept art. It looked like a Giant Killer Ostrich, basically.”

First on Double Negative’s agenda was developing a feather-generating system, not only for the terror birds but also for vultures featured in a later scene. “When we started looking at the concept art,” Wuttke said, “there was a big push for us to put together an ostrich feather look, so we experimented with different ways of doing that. We started off with a straight fur system, but we couldn’t get the structure within the feathers that we wanted. The closest we could get were these furry barbs, which wasn’t fulfilling the brief. So we ended up writing a completely separate feather tool. We resurfaced the feather system slightly so that we could grow fur out of the feather geometry, and we ended up with these furry ostrich feathers, each of which had dynamics and collisions and things like that. Via the fur, we were able to get real lighting dynamics across the feather. Also, we’d written all sorts of shaders specifically for the fur, which we used for the feathers, as well.”

Double Negative artists — in particular, Kristin Stolpe — spent a lot of time creating skin textures for the un-feathered parts of the bird, such as its head and neck. Fine detail was essential, as some shots had the camera in extreme closeup on the bird’s face. Double Negative emulated a volumetric approach to the skin by creating multiple layers of texture. “One texture would detail what was



Tatopoulos Studios made a scaled saber-tooth tiger model for production to use as reference for two sequences featuring the big cat. Artists sculpted a hairless version of the prehistoric predator – maintaining lean proportions to allow for the thickness of a rabbit pelt applied to the model in lieu of punched hair – then painted and detailed the rabbit fur with subtle tiger markings. Tatopoulos crew member Jeff Himmel grooms the completed maquette.

happening underneath the skin,” explained Wuttke, “then there would be another texture to add detail over the top of that. We had a lot of specular maps over the whole thing, and we brought our proprietary subsurface scattering techniques to bear.” Skin textures endure close scrutiny in the first shot of the terror bird — a view of the creature’s eye peeking out through reeds. “The eye is almost full-frame in that shot, so you see all of this very detailed skin around the eyeball. Our shading supervisor, Dan Kripac, invented a few algorithms to add procedural detail, so we never ran out of textural resolution.”

Double Negative animators, supervised by Rob Hemmings, invested many man-hours in animating the terror birds, developing a set of behaviors as fierce and menacing as the creature’s mien. “We wanted to give these creatures a real sense of foreboding and dread,” stated Wuttke. “Karen Goulekas spent a lot of time with Rob Hemmings and our animation team working through post-viz first — which was essentially just shot blocking — and then getting into the actual character animation. Because of the way the creature was rigged and the way the limbs were put together with an inverse knee, it was very difficult to come up with a run that didn’t look goofy. But the animators did a terrific job of giving the terror birds a very sinister feel.”



D'Leh falls into a pit where a saber-tooth tiger lies pinned beneath a log. When a storm breaks, D'Leh moves the log – intending to use it to escape the rain-filled pit – and opts to free the animal rather than slay it. Requiring complex interaction of CG fur – both wet and dry – and digital water, the Double Negative sequence was among the most technically difficult of the show. / D'Leh again encounters the saber-tooth tiger in an abandoned village. To maintain the cat's photorealism in bright sunlight, compositors employed high dynamic range imagery to drive the lighting on the creature, and devised a multiple-shader-pass approach to allow for flexibility and creative latitude on a shot-by-shot basis.

Double Negative composited the terror birds into lush jungle environments that had been simulated on stage or captured on location in South Africa. The sequence starts in an area of dense reeds, where production had shot terror bird stand-ins — performers in blue suits holding sticks with beaks at the ends — as a means of giving the actors something physical with which to interact, and to guide the visual effects team as to placement of the CG creatures. Double Negative executed a fair amount of rotoscoping within the reeds to isolate the backgrounds and place the terror birds in the setting. Artists also augmented the foliage in the plate with digital reeds. “Obviously,” said Wuttke, “with the birds crashing about through this dense section of reeds, it was expedient for us to add in our own reeds. We spent some time working on the dynamics of the reeds: how they should bend, when they should snap, what tolerances there should be. We painted out the guys in blue suits, placed our terror birds; and then, in front of that action, we placed more digital reeds. Roland was quite specific in that he didn’t want to see much of the birds at the beginning of the sequence. The digital reeds were a device for him to be able to shield the birds from full view too early.”

The sequence then moves into a more open, fern-covered terrain. There, too, Double Negative augmented the plates with digital foliage, simulating interaction with the attacking birds. “There is a carpet of ferns,” said Wuttke, “and to get the interaction we wanted from the birds crumpling these things underfoot, we populated large areas of the plate with our own procedural ferns. Those were all written as simple dynamic curves. At render time, we used the animation of those dynamic curves to drive deforming fern geometry, making it look as if the birds were trampling over them. That allowed us to have quite a large numbers of ferns in shot at any given time, without having to worry about the overhead for animators or effects artists. They could just deform these curves, which are relatively lightweight; and then the actual geometry would be built at render time.”

The mammoth hunters survive the terror bird attack, but D’Leh becomes separated from the group and falls into a large pit where a saber-tooth tiger lies pinned beneath fallen logs. Double Negative created the tiger for this and subsequent sequences, basing its look loosely on Tatopoulos Studios drawings. “The design evolved over a long period of time,” stated Wuttke, “and we were always moving between different camps. One day we’d be working towards an actual tiger physique. At other times, we’d be moving more toward a liger, which is a cross between a tiger and a lion. It was an evolutionary thing that really only came to a head towards the end of the show.” The final saber-tooth tiger sported subtle markings and a very large, powerful physique. “The physiquing of the

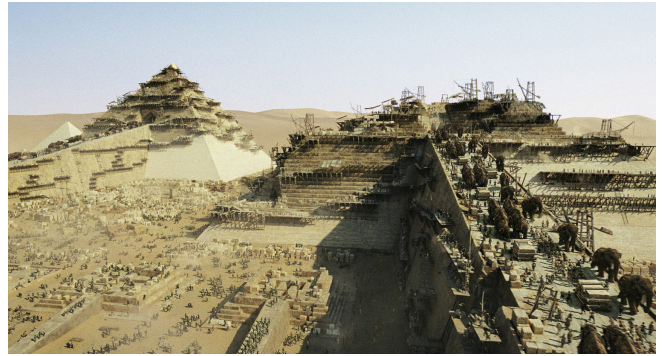


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tiger was something we spent quite a bit of time on because it was key to his screen presence — that solid feeling of mass, with massive shoulders and neck and flanks. In some ways, the modeling of the tiger was more about defining the volume; and then the real details came through from the muscle system.”

The saber-tooth tiger would be subjected to close and prolonged camera scrutiny, much of it in direct sunlight. That fact had led Double Negative to engineer a new fur pipeline, aimed toward generating a wide variety of fur looks. “On certain parts of the tiger,” stated Wuttke, “such as the rough around the neck, there is quite long fur. Our new system had to be able to generate and cope with that long fur, as well as the shorter type covering the rest of the body.”

To create the saber-tooth tiger’s performance, Double Negative animators and muscle TDs referenced lion, tiger and cheetah HD footage that Karen Goulekas had shot at an animal trainer’s facility in South Africa. The Double Negative team also made frequent trips to London Zoo to study the big cats live. The team studied stalking movements, facial expressions, walk cycles, the way shoulder haunches rolled when the animals walked — every detail of feline behavior. “We paid very close attention to all of those things,” said Wuttke, “and then we spent a lot of time re-creating them in the animation. The performance had to be exactly right because in many of these shots the camera really lingered on the tiger, and the audience had a lot of opportunity to analyze its motion.”



The mammoth hunters’ trek takes them to Giza, where warlords use captured slaves and mammoths to build massive pyramids. MPC and Double Negative split the sequence, with the former taking most midground and closer shots and the latter executing long establishing views. Some shots were shared. For a view of the pyramid construction site, MPC added CG mammoths and used its proprietary crowd software, Alice, to populate ramps and expansive surroundings with slaves and guards.

D’Leh’s attempts to climb out of the pit are to no avail; and the stakes become greater when a storm breaks and the pit begins to fill with rainwater. Production shot the scene in a water tank dressed with logs, dirt and debris, according to extensive previz of the sequence. “It was a bit more of a technical previz than the others,” remarked Karen Goulekas, “because we had to nail down the size of the tiger and the position he was going to be lying in. We had to define that in relation to the space so that the art department would know where and how to lay in the logs and branches to pin him down. I went even further and asked our special effects supervisor, Dominic Tuohy, to build a full-size blue tiger. We sent him the model, and from that he built a blue prop with a rotating head. We stuck that in the pit and put the logs and twigs over it. Ultimately those had to be replaced or augmented with CG logs because the tiger is struggling underneath them and they are moving; but Jesper and I decided to leave all of that real stuff in the plates, and paint it out later where we needed to.”

With the water level rising, the saber-tooth tiger thrashes in the pool, trying to break free of the pinning log. “Complexity-wise,” stated Goulekas, “this was the most difficult sequence in the film. The Giza sequence at the end was more difficult technically, in terms of numbers of layers and elements; but this was the most complex in that we had a full CG tiger in closeup, thrashing around in water.”

“Fur by itself is hard enough to do,” added Alex Wuttke. “And water by itself is also very difficult. In this particular case, we had the two interacting and mixing together. There was this reactive feedback loop: the fur disturbed the water, which in turn made the fur move and behave differently, which in turn made the water move in a different way. It was extraordinarily complex.”



To rescue their tribe members, captive among the slaves, D’Leh and his band infiltrate the workers and hatch a plan to incite an uprising by stampeding the mammoths. Plates from a miniature set shoot were first delivered to Double Negative, where effects artists added Nile river elements in the background. Thus enhanced, the plate then went to MPC, which laid in its animated mammoths and distant slave crowds. MPC also composited in live-action elements shot by the main unit in Namibia.

Upon receiving the water pit plates, Double Negative generated post-viz for the entire sequence. Goulekas and Emmerich examined the post-viz shots to determine where the real water in the plates would have to be replaced with CG water. “In most of the plates,” Wuttke recalled, “we wound up completely replacing the water. But we used the water that was in the plate as reference, to give us a good idea of lighting and how the water should look. We did a lot of side-by-sides, where we had our digital water next to the real plate water. Martin Nguyen, who was the water supervisor, spent a very long time writing shaders to give us the control we needed over our digital water, and to give part of that control to our 2D department so they could grade different aspects of the water.”

Some of the most challenging composites in the sequence were those in which the visual effects team opted not to replace the water in its entirety, but only in specific areas. “Where we just replaced patches of water around the tiger the compositors had the difficult job of blending the digital water seamlessly into the real plate water,” said Wuttke. “Gruff Owen, who was the lead for the 2D compositing of the water, did an amazing job blending the digital water into the live-action water; but, where we could, we replaced all the water digitally. It was a lot easier.” Compounding the complexity of the pit shots were raindrops striking the surface of the water in the plate. Double Negative built a proprietary system to generate procedural simulations on top of the plate water, representing rain hitting the surface and kicking up little droplets.

To simulate the look of a wet tiger, Double Negative engineered significant modifications in its fur system, first studying the properties of fur when it comes into contact with water. “We studied wet fur quite a lot,” observed Wuttke. “We dipped big furry rugs into water tanks and pulled them out to see how water streamed off and what happened to the fur over time as it transitioned from wet to dry. We built certain hooks into our fur system to simulate that dynamic and create animated clumps of fur. So our furless tiger model, with all its muscle dynamics working, would drive the simulation of the water. We’d then take that simulation and do a special render that would tell the skin which bits were in water and which bits were out, and also how long those bits had been out of the water so we could fade off this water line. We would use that wet map to drive the clumps and to drive the dynamics of the fur. Where the fur was just above the water but in contact with it, some of the fur would cling to the surface. As it got pulled down under the water, it would transition into this tight wet clump of hair. Then, as it came out again, it would expand and dry out a bit. It was very complex.”

The storm sequence also features vultures tearing at the flesh of an antelope carcass in the pit. The vultures became the test-bed for Double Negative’s new feather system, written by Julian Mann. “It was an amazing system,” stated Wuttke. “Julian wrote it in a very modular way, so we had a lot of little tools that we could plug in — which meant we had enormous flexibility. That was really important for us, because when we’d visited London Zoo to look at live vultures we’d noted that their feather patterns are very distinctive. We had to have tools that would give us a lot of flexibility in grooming the feathers. The vultures also have this long featherless neck and head — so, again, we had to bring out our skin shading tools. The skin had to have a certain amount of translucency. Also, because it was raining, we studied the way water reacted on oily feathers, and then we engineered that whole dynamic.”

D’Leh determines that his only hope of escape is to remove the log pinning the tiger, lean it against the wall of the pit and climb out. But the prospect creates the dilemma of whether he should kill the tiger before removing the log, or let the tiger go and take his chances. D’Leh decides to free the tiger — and when he does, the animal walks toward him, confronts him face to face, and then leaps out of the pit, leaving him unharmed.



Although Karen Goulekas originally envisioned a CG Giza environment, Emmerich opted to realize the entire setting as a miniature, shooting it in natural sunlight and against the dramatic backdrop of Namibia’s coastal sand dunes. The completed 1/24-scale set – built by miniature supervisor Joachim Grüninger and his Magicon team – was the size of a football field and featured pyramids under construction, the warlord god’s palace, slave quarters and other structures.

The film then follows the reunited D'Leh and Tic'Tic (Cliff Curtis) as they enter a seemingly empty and plundered village to scavenge for food. Soon, tribe members surround them, believing them to be the warlords who previously raided their village. The villagers are preparing to kill D'Leh and Tic'Tic when the saber-tooth tiger appears, sniffs at D'Leh, roars and — apparently recognizing him as his savior from the pit — walks out of the village. Now believing D'Leh to be a god-like being who can tame even the spirit of a saber-tooth, the villagers lay down their weapons.

Though the tiger in the water pit was far more difficult a sequence technically, the tiger in the village presented the visual effects artists with some of their most challenging shots from an aesthetic standpoint. “This was a scene where we were in sunlight and we had closeups on the tiger’s face,” commented Karen Goulekas. “There were details in the tiger’s face that we didn’t have to deal with in the terror bird or the mammoth because the camera never stopped on their faces for any length of time. The tiger had to have very detailed animation, too, with panting, eyeblinks, ear flicks — everything.”

“The tiger action in that scene is quite languid,” added Wuttke. “The tiger moves very slowly towards camera, and we are tight on the creature a lot of the time. There’s also a great sense of menace in the tiger; and we had to build that into the animation, as well.”

Double Negative also produced shots for a port sequence in which D'Leh and his men climb over a sand dune and spot hundreds of slaves being loaded onto large sailboats on the Nile. The sailboats, which sport huge red sails, are the ‘giant red birds’ D'Leh has heard spoken of in his travels. Production shot empty plates for the scene in Namibia, capturing a dramatic desert terrain. Double Negative generated CG Nile and sailboat elements, and then tracked and composited them into the plates. Double Negative



Up to 70 modelmakers spent four months building the miniature at the Magicon shop in Munich, then shipped it, in parts, in fifteen 40-foot containers to Namibia, where it was assembled in the desert. Among the benefits of the location were smallish sand dunes that read as appropriately large-scale against the miniature. Modelmakers also fashioned custom miniature dunes from the real desert sand to fill in areas immediately surrounding the set. / In the course of a five-week shoot, the miniature unit filmed the model from a three-towered Spydercam rig and a variety of cranes, emulating camera moves and positions established on the live-action set – being shot concurrently nearby – without benefit of motion control.



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also used Massive crowd simulation software to generate slaves, guards and horses.

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The action continues with the characters finally arriving at Giza, where thousands of slaves and hundreds of harnessed mammoths drag enormous stone blocks up a series of ramps and scaffolds, erecting the massive pyramids that will stand in tribute to pharaoh gods. Due to its complexity and volume of shots, the Giza sequence was split between Double Negative and The Moving Picture Company. The former tackled wide shots — including the opening reveal of the partially constructed pyramids rising out of the fog and later shots of tens of thousands of slaves storming the warlord palace — and the latter executed closer shots featuring its CG mammoth.

Both companies started with plates shot on a massive Giza miniature, built by miniature supervisor Joachim Grüninger and his Magicon team and shot by director of miniature photography Britta Mangold on location in Namibia. “My first instinct was to go with a CG environment for this sequence,” admitted Karen Goulekas, “because I thought that would give us more flexibility. But Roland wanted to shoot a miniature in the natural surroundings of real sand dunes and sky — and it was a great idea. We got all of that terrific setting for free by shooting the miniature there. Of course, in post, we had to change the skies to make them look consistent, because we were shooting on different days and the skies changed. We also added more sand dunes.”



With the guards distracted by stampeding mammoths, the slaves rise against the warlords, storming the god’s palace and setting his ship ablaze. Double Negative produced a long shot of the scene, integrating its Nile river elements package – which included digital water, palm trees, the palace and ship – with model photography. Double Negative populated such shots with crowds generated in Massive, using data from a motion capture shoot conducted in London.

The Giza miniature was 1/24 scale; but even at that small a scale, the set covered a space the size of a football field. The miniature photography unit shot the model from a three-towered Spydercam rig and a variety of standard cranes, while main unit shot its live-action with actors simultaneously. The main unit took careful note of camera positions and other data, then translated that data to 1/24 scale so that camera moves and positions could be replicated on the miniature. “We were very meticulous about getting the camera positions, the angles, the lens, and the time of day,” said Goulekas. “At the end of every day, those camera reports went to a coordinator whose sole job was to take that information and make new plate data sheets, scaling it down to 1/24 scale and showing where the camera would be positioned on the miniature. Those data sheets then went to the miniature photography unit, which would try to replicate all the camera work and the time of day so that the sun angle would be the same. It worked out fantastically.”

MPC on-set supervisor Gary Brozenich oversaw visual effects concerns during the model shoot, and also photographed the set from all angles, creating tiles that would be used to give Emmerich after-the-fact flexibility as shots evolved in postproduction. “Initially,” said Nicolas Aithadi, “the idea was that we would take the shots from the miniature as they were and populate them with our slaves

and mammoths. But quickly we realized that the 2D roto that would have been necessary to place people behind all these ramps and scaffolding would have been astronomical. So we decided to redo a lot of it in CG.” CG supervisor Guillaume Rocheron was instrumental to the CG rebuild of the Giza miniature. “From the pictures Gary took on set we re-created all the geometry of the set — the ramps, the scaffolding, 20,000 blocks — and then we reprojected the pictures onto this geometry to re-create the entire miniature inside the computer. It was easier to have this CG environment that we could put the slaves and mammoths into than to try to roto everything in the live-action plates. And once we’d rebuilt all the geometry and projected pictures from the miniature on it, you couldn’t tell the difference.”

Double Negative added to the environment, generating a package of Nile elements that included the river, sailboats, flags, palm trees and a palace. Even shots slated for The Moving Picture Company made an initial stop at Double Negative so that the Nile elements could be incorporated into the model photography. “Double Negative would comp those elements into the plate,” explained Karen Goulekas, “and then deliver that plate to MPC. As far as MPC was concerned, those Nile elements were really there when we shot the plate! And then they added their mammoth and other elements over that.”

Much as he did in the opening hunt sequence, D’Leh incites the captive mammoths to stampede, providing slaves the opportunity to rise against the warlord guards and storm the palace. “These are really cool shots,” observed Goulekas. “There are at least fifty mammoths stampeding, and hundreds of thousands of people running, fighting, and taking out guards.” To populate their shots with running and fighting slaves, both Double Negative and MPC used data from an extensive motion capture shoot conducted by Audiomotion in London. “We had fifty cameras going, which I’m told was the largest motion capture setup ever done in Europe. I had them build a chunk of blue ramp so people could run up and down it. And we built some blocks for stunt people to jump off of. We captured all these little chunks of action; and then MPC and Double Negative used that motion capture to animate and populate areas of the set.”

Double Negative used the mocap in conjunction with Massive to create the crowds in its wide shots, and also populated them with mammoths, the model and textures for which were provided by MPC. MPC imported the mocap data into its proprietary Alice crowd generator. “Some of those shots had as many as 200,000 characters in them,” said Greg Fisher, “along with the 150 mammoths running up and down ramps. There were so many, it would have been impossible to handle it all with just keyframe animation; and so we used a combination of Alice, keyframe animation and motion capture to generate those characters. We would use the motion capture and then do a post-sim on top of that to change it as needed. We also hand-animated digital doubles in a few shots, just because we didn’t have the appropriate motion capture available to us to get what Roland wanted. We get pretty close to these guys, often half-screen and sometimes even three-quarters-screen or bigger. Doing digital doubles that close to camera and at such a level of detail was a new thing for MPC.”

For the mammoths, MPC keyframe animated a library of cycles. “We had mammoths running uphill,” stated Fisher, “mammoths running downhill, mammoths coming around corners, mammoths eating, mammoths fighting — and we used all of those with Alice. In some of the big,

key shots, we keyframe animated a dozen or more mammoths by hand.” MPC had a team of 25 keyframe animators working on the sequence, and a team of eight working on the Alice team.

At the height of the slave uprising, the warrior god stands at the top of the palace stairs to face the hostile crowd below — and then is struck by one of Machine FX’s deadly CG spears. “Whenever someone gets killed in this movie,” commented John Lockwood, “it’s usually by one of our spears or arrows. For this shot, we also tracked some wounds onto the god; so as he tumbled down the stairs, you could see the impact. And then, at the very end of the sequence, there is a closeup of him rolling onto his back, and you see that he’s got a huge hole in his chest. We created that hole in CG, as well.”

One of the challenges of the shot arose from the fact that the god was wearing flowing, semi-transparent robes. “We had to essentially remove all his clothes,” explained Steve Street, “and then make some CG flowing robes and track all that on. We used the latest Maya Cloth simulation, with a few other bits in there, as well. Replacing the robes, combined with the fact that this was a very key moment in the film, made that shot probably our most challenging on the show.”

With the fall of the warlord god, slave and beast are freed, Evolet and D’Leh are reunited, and the film comes to a close. At 641 shots, the total effects count for 10,000 B.C. seems relatively modest given the epic, sweeping grandeur of the man-versus-man-and-beast tale. But numbers alone do not fully reflect the massive scale of the effects assignment. “10,000 B.C. was a typical Roland Emmerich show,” remarked Karen Goulekas, “in that it fools you. You think: ‘641 shots? That’s not so much.’ You look at a sequence, and you say, ‘Oh, well, that’s only 150 shots — how hard could that be?’ And then you find out how hard it can be, because each of those shots is so complex and has so much meticulous detail. That’s always what you get in a Roland Emmerich film.”

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Fierce Creatures

image

ARTICLE BY JOE FORDHAM

The Spiderwick Chronicles, a children's fantasy by Tony DiTerlizzi and Holly Black, told the tale of three young siblings who move to a tumbledown rural New England mansion and discover their new home overrun with fairy creatures. The story, published in five slim volumes, was packed with illustrations and spawned several companion publications, including an elaborately rendered bestiary of fantasy creatures, Arthur Spiderwick's Field Guide to the Fantastical World Around You.

When a screenplay adaptation of The Spiderwick Chronicles appeared at Tippet Studio during production of Charlotte's Web, artists leapt at the material and, without official sanction, sank their teeth into a screen test of some of the Spiderwick Estate's more scurrilous inhabitants. "A bunch of our animators were fans of the book," stated Tippet Studio founder and creature supervisor Phil Tippet. "Completely unbeknownst to me, they hijacked the script, appropriated some resources and went for it. The first couple of tests looked so great we just said, 'This is terrific, let's keep going.'"

The first test began with a 3D model of a squat goblin character resembling a bipedal amphibian with scrawny arms and vicious teeth, which lead modeler Sven Jensen modeled in Mudbox. Tippet Studio visual effects supervisors Joel Friesch and Blair Clark colluded to bring the model to life with textures and puppet rigging, and then created a small colony of creatures. Animation supervisor Todd Labonte and a small crew animated vignettes of a goblin brandishing weapons, and lead animator Michael Brunet created an action sequence in which the creatures splashed in a lake before being attacked by a mysterious underwater shape.

Phil Tippet presented the material to producer Kathy Kennedy and director Mark Waters, and the filmmakers responded enthusiastically to the boisterous interpretation of DiTerlizzi's and Black's imaginary characters. "We wanted to 'biologize' the Field Guide drawings," said Tippet. "Tony's drawings had a little bit of a Brian Froud and Arthur Rackham quality to them, but they also felt like two-dimensional interpretations of animals that Arthur Spiderwick sketched as he was gaining insight into the invisible world. We imagined the artwork was Arthur Spiderwick's, and we set about translating the drawings back into the animals that Spiderwick observed in the field."

The screenplay, written by Karey Kirkpatrick, David Barenbaum and John Sayles for Paramount Pictures and Nickelodeon Movies, featured many creatures from the books, including goblins, an overlord shape-shifting ogre named Mulgarath (Nick Nolte), a rampaging troll, a portly orphaned hobgoblin named Hogsqueal (voiced by Seth Rogan) and a tiny brownie guardian of the Spiderwick Estate named Thimbletack (voiced by Martin Short). To realize the ambitious lineup, the production divided up effects duties between Tippet Studio and Industrial Light & Magic. "Very early on, we decided to share effects with Tippet Studio and ILM," said the film's co-producer and visual effects producer Tom Peitzman. "Phil Tippet remained our overall creature supervisor, guiding initial design and development of all the characters. ILM designed the characters that they were handling; but we asked Phil to be a part of that, too, to give us a consistency of look and performance."

ILM visual effects supervisor Pablo Helman joined Tippett Studio for the main production shoot in Montreal. In postproduction, Helman then ceded duties to visual effects supervisor Tim Alexander, who oversaw ILM's stable of characters — Thimbletack, his alter ego Boggart, Mulgarath, a winged griffin, two breeds of ethereal fairy folk — and a host of ancillary effects.

Before shooting began, the filmmakers laid out biological ground rules to establish styles of creature behavior. "Whenever you're matching fantasy creatures into photographic backgrounds," observed Phil Tippett, "you have to keep it real. That's why I insist on doing a lot of reference work at the beginning of a project. I like to accumulate material and live in the biological world for a couple of weeks, looking at nature documentaries, studying creature motion, growing volumes of reference. We then threw all that out and started to use the imagination — but the real stuff bubbled in the unconscious."

Animators studied live amphibian and reptile life models and visited the Berkeley East Bay Vivarium to experience specimens first-hand. "The Internet is a great resource for visual effects artists because you can find video of practically anything online," Todd Labonte commented. "But to actually hold and squish an animal in your fingers, to feel where muscles are located and how skin slides over bones is invaluable. We were particularly interested in frog blinks and gullet motion, and we tried to mix those facial characteristics with the movement styles of gorillas, which was how goblin anatomy was structured."

To develop shot designs, Tippett Studio and ILM shared creature data and designs with Halon Entertainment, where previsualization supervisor Dan Gregoire generated 3D animatics for action sequences. "Halon had teams in Los Angeles and on location with us in Montreal," stated Tom Peitzman. "We targeted the heaviest visual effects sequences, trying to be as specific as we could about what characters were doing. Working with young performers, we tried to map things out in detail so they could see what we had in mind."

Production designer James Bissell built the film's main location, a three-story gothic house representing the Spiderwick mansion, on location in Cap-Saint-Jacques in Montreal Nature Park. The set included a façade of the building complete with a ground floor interior, which the production also reproduced at Mel's Cité du Cinéma Technoparc Studios in downtown Montreal. Three weeks before shooting, Phil Tippett and Pablo Helman met with representatives of Michael Lantieri's and Louis Craig's physical effects teams to plan special mechanical effects for on-set creature interactions. "We relied on physical effects a lot," commented Tippett. "In preproduction, I had a huge list of things for Michael's foreman, Don Elliott, and Louis' floor supervisor, Mario Dumont. For scenes where creatures were interacting, kicking up leaves or pulling apart trees, they built all sorts of rigs and jigs to push and pull kids that were ultimately going to be removed."

The division of labor on set was characterized by the combination of Pablo Helman's experience in digital effects and compositing and Phil Tippett's rich history in creature animation. "I admired Phil's work, but I had never been on set with him before," Helman remarked. "It was great to have Phil's experience on set so I could concentrate on shooting visual effects and the reference part of the creature work. It worked out great between us."

"Pablo and I were like a tag-team wrestling group," Tippett concurred. "When ILM-contingent shots came up, I'd step back and watch. If there was anything that I thought was problematic, I'd point it out to Pablo and let him lead — and then, vice versa. Our strengths were complementary, because I know a lot about creature layout, blocking, continuity and choreography; and Pablo was really strong on the technology and how to put shots together. We both had a good understanding of editorial issues and we shared a mordant, ironic sense of humor; so we connected on that level, too. In the movie racket, the one thing you can plan on is things going wrong, so it's great to have a partner that you can have fun with while things are blowing up around you."

The film begins with an introductory flashback — one of several montage sequences created by Imaginary Forces — and then transitions 80 years forward, depicting the Spiderwick mansion falling into disrepair. ILM generated the transition using a digital version of the mansion created from photographic reference of the Montreal set, reverse-engineered with an animated transition into its present-day dilapidated state.

For shots of the Grace family arriving at its new home, ILM generated splitscreen effects of twin brothers Simon and Jared, with actor Freddie Highmore playing both parts. "We had to plan the shoot very carefully with our young performers," observed Tom Peitzman. "The age of our actors meant we had five hours of shooting per day. Luckily, Freddie was very adept at doing an Indy-500-style pit stop: he'd shoot the 'A' side as Jared, go into a tent off the set, change into Simon and come right back out and do the B-side of the shot. Pablo Helman and I wanted to give Mark Waters the flexibility to craft twin shots as organically as possible, sometimes shooting handheld. We did a handful of scenes using motion control for longer takes of Simon and Jared in the kitchen and in their bedroom. But most of the time we used brute-force tracking in postproduction to match camera moves."

Helman timed repeat passes of twins shots using audio playback counters, video assist and limited bluescreen separations. For the first twin reveal — a two-shot that panned and racked focus from Simon in the front seat of his mother's sports utility vehicle to Jared in the back — the camera operator performed two passes with Highmore occupying alternate seats. ILM 2D supervisor Nelson



Mallory Grace (Sarah Bolger) and her twin brothers, Simon and Jared (Freddie Highmore), plan an assault on fairy folk that infest their home in *The Spiderwick Chronicles*. The adaptation of Tony DiTerlizzi's and Holly Black's fantasy books became a pet project at Tippett Studio early in preproduction. Director Mark Waters developed concepts with creature supervisor Phil Tippett, and divided creature animation between Tippett Studio and Industrial Light & Magic. ILM also handled shots of the twins, relying on postproduction tracking to composite repeat passes of Freddie Highmore, often filmed without motion control.

Sepulveda then oversaw integration of plates in Apple's Shake and ILM's Commodore using camera tracking, rotoscoping, digital paint and compositing to blend Simon and Jared behind the vehicle's windshield. "Wherever we were unable to get a good matchmove," commented Tim Alexander, "we used anything from a one- to a two-point track, to a corner-pin to get the important portions of the plates to lock together. The compositor figured out where to do the split; and that dictated how much roto and plate reconstruction we had to do."

ILM's character animation began with the appearance of Thimbletack, an eight-inch-tall brownie who materializes from thin air when Jared stumbles on a disused office in the attic of the Spiderwick mansion. Tippett Studio initiated development of Thimbletack with a clay sculpture by Mark Newman, and a poseable maquette that the production wardrobe department outfitted with a tiny costume. "The puppet Thimbletack gave us a pretty good idea of eye-lines, scale and lighting reference," explained Pablo Helman. "We also worked with Michael Lantieri in creating some of the interaction that happens when an invisible creature goes through a scene. We choreographed Thimbletack's opening and closing of filing cabinet drawers with Michael's team, for example. Whenever Thimbletack picked up an object, we generated that in CG."

ILM developed a 3D animated Thimbletack by first rapid-prototyping a simplified version of the model for animators. Simultaneously, ILM began look development to refine character details. "Thimbletack was a mix of animal and human," observed ILM art director Christian Alzmann. "We went through a spectrum of the most animalistic mouse and rat looks to more humanistic designs. The challenge with a character that is eight inches tall was creating believable scale. We gave him little mouse-like whiskers, which helped emphasize his size and bring him into the natural world."

Alzmann aged the puppet costume, sanding down edges and using dark tea stains to convey 80 years of wear and tear, as reference for creature supervisor Jason Smith who oversaw digital cloth simulations scaled to emulate the bends and folds of brownie-sized wardrobe. "We went through a lot of cloth sims with different weights and speeds," remarked digital production supervisor Michael Bauer. "Thimbletack's costume was supposed to be made of found items so it had to have the scale of bigger items on a smaller creature, but we tried to accommodate subtler movements in the cloth, as if Thimbletack had tailored his own clothes."

Look development artist Damian Steel balanced digital light-scattering effects to emulate the delicate translucency of Thimbletack's skin. Different thicknesses of hair created blends between a silky mouse-scaled pelt and whiskers and more human-like hair, including scraggly sideburns, facial fuzz, and thread detail on Thimbletack's clothing.



Jared meets Thimbletack, an eight-inch-tall brownie with a passion for saltine crackers and honey, who can become invisible at will. Tippett Studio initiated the character's design with a clay sculpture. During shooting of the Thimbletack scenes on set, ILM visual effects supervisor Pablo Helman used a maquette outfitted with a tiny costume to gauge eye-lines, scale and lighting reference. ILM then generated a CG character combining animal and human elements, and used its new facial animation system, Fez, which gave animators the ability to create a performance by sampling a palette of predetermined facial expressions.

Cloth, hair and skin renders were further complicated in scenes where the normally placid Thimbletack grows irritable and transforms into bulbous green-skinned Boggart. “Boggart was bumpy and slimy, very much like a toad,” explained Alzmann. “We used one particularly nasty photo of a fish belly as reference for his skin, as well as our library of skin diseases.”



When roused to anger, Thimbletack transforms into the bulbous, toad-like Boggart, a larger and more aggressive alter ego who can only be appeased by the consumption of honey. ILM built Thimbletack and Boggart using a shared 3D mesh to create one interchangeable character. The creature rigging allowed transformations by blending between common local values on the digital character, adding and manipulating shapes to fill out the creature's volume. Animators executed push-and-pulls on the character to make Thimbletack erupt into the psychotic Boggart and then slowly revert back as he is mollified by honey.

Thimbletack's transformations into Boggart form were designed to comic effect as swift psychotic outbursts. “It was a Jekyll and Hyde personality,” stated Tim Alexander. “Thimbletack's goal in life was to protect the house, and inside him was this monster that exploded if the house was threatened. And then, when Thimbletack turned back into a brownie, it was a calming effect. Thimbletack is embarrassed about having lost control; so he's nervous, trying to push down his hair and refasten his buttons.”

Jason Smith's creature team achieved transformations using a shared 3D mesh. “Thimbletack and Boggart were one interchangeable character,” said Bauer. “We built our rigs in our Blockparty rig kit, giving each character identical nodes, and blended between local values as they moved through the transition. We added shapes to support the rig transformation from skinny little Thimbletack to his bigger Boggart form to fill the volume out, and then manipulated those shapes to get the effects the director wanted. Texture paint was also interchangeable to provide flexibility in the look of the transformations.”

The one-to-one match in model topology gave animators the dexterity to push and pull Thimbletack through transformations while the principal features, such as nose and eye sockets, remained constant. “We could pose the character halfway between Thimbletack and Boggart,” related ILM animation supervisor Tim Harrington. “If we wanted an arm to grow to Boggart length, we could dial on a brownie arm and then dial on the Boggart model, using one rig to manipulate it and make it change.”

ILM's character animation made use of a new facial animation system, ‘Fez’ — engineered by Fred Pighin and Eduardo Hueso — replacing the studio's award-winning ‘Cari’ animation system, as well as a new interface module, ‘Facedon’ — developed by Hiromi Ono — which enabled animators to sample a palette of facial muscle expressions. “Fez allows us to codify any kind of animation data and put it into a system where it's more animator-friendly,” explained Tim Harrington. “It can use keyframe, motion capture or keyframe on top of motion capture and allows us to control everything in one system. We didn't use any motion capture in Spiderwick — with Phil Tippett's influence, we all decided characters should be keyframed — but Fez turned out to be a great system for solving

muscle groups. Animators were able to quickly block in facial animation, with fewer shape-fixes afterward.”

Lead animator Delio Tramontozzi defined Thimbletack and Boggart performances using Fez to maintain quality control. “Delio created Thimbletack’s expressions in Facedon and our new rig, FaceSelect,” said Harrington. “Once we got the character to a place we liked, animators used those shapes to create a performance. It kept the character ‘on model,’ like a traditional drawn animation model sheet, and it helped keep the performance consistent.”

Thimbletack is first revealed in fleeting glimpses through a glass jar on the study shelves. Nelson Sepulveda’s team used mattes and 2D refraction techniques to create distortions of the creature through glass and used depth of field cues to integrate Thimbletack into his environment. Tiny smudges and footprints in dust completed the illusion. “When we got the camera down close to Thimbletack’s level,” said Tim Alexander, “a thin layer of dust on the desk appeared to be the thickness of snow at that scale. We generated footprint mattes in 3D and then compositors did offsetting tricks, embossing the footprint shapes to give them a little bit of a lip, and applied shadowing in 2D.”

While Jared becomes acquainted with Thimbletack, unseen forces in the front yard drag Simon away into the trees. Freddie Highmore performed the abduction sequence manipulated by a special effects rig. Tippett Studio animated creature interactions, with flying leaves and a horde of goblins that become visible when viewed through a magical ‘seeing stone.’ “The seeing stone effect was a 2D comp with slight warping and color effects around the fringes of the image,” said Tippett CG supervisor Russell Darling. “For point-of-view shots through the stone, we animated a CG stone in foreground and did a treatment to the background plate to create a hyper-realistic, slightly contrasty, slightly exaggerated color palette with optical warping effects.”

To create the goblins, Tippett Studio built six body types that lead modeler Sven Jensen developed with lead character technical director Jeremie Talbot. “The goblins were like Mulgarath’s pitbulls,” stated Joel Friesch. “We wanted them to be quite formidable, but soft and fleshy, with reptilian arms, hands like chicken feet, and lots of teeth. We worked out a muscle system where we could make their flesh wiggle and flop as they jumped around, and a face rig within Maya that had sliders built in that we could use to pick proportions and color maps.”



Vicious goblins seize Simon outside the Spiderwick mansion. While shooting goblin scenes, the production made use of three-dimensional maquettes to assist performers and the camera team on set, and blocked out creature choreography using foamcore standees. Tippett Studio artists generated digital goblin characters based on six body types, with interchangeable parts and variable color schemes to create multiple permutations. Animators then assigned personalities to suggest hierarchies in the goblin army. Compositors incorporated CG grass and leaf interactions to blend goblins into the plates.

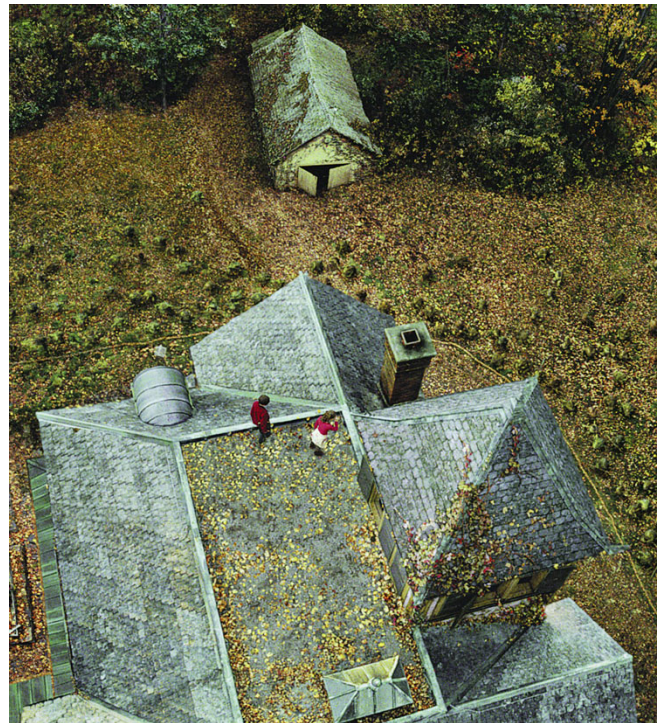
The Tippett animation team assigned goblin types to suggest hierarchies in the goblin army. “We asked modelers to build us the fattest possible goblin and the scrawniest little guy they could imagine,” Todd Labonte related. “We then had them break that into parts — arms, belly, legs, head — and we set up a bunch of different combinations. We made a dozen or so stock ‘kits’ and a bunch of different texture maps that animators could use to populate their scenes. Those became templates we used to keep continuity — so the goblin with the fat head and the tiger stripes was always the leader, or the guy with the green spots, thin little legs and holding the stick was always lagging. For the most part, we referred to the characters as letters, but Jason Armstrong, our lead animator, gave them names — like ‘Tiny,’ ‘Larry’ and ‘Stacy’ — just to randomize them. Tiny was of course the biggest, fattest, dumbest one. You’d look at him and know that he was at the bottom of his class of graduating goblins, but he was the guy you’d want at your back when you were in a fight.”

Goblins use their invisibility during skirmishes, and then materialize at will. “We tried to avoid the two classic invisibility gags of *Star Trek* and *Predator*,” stated Joel Friesch. “Mark Waters wanted them to fill up from the feet, like pouring water into a glass; and so we started there, but randomized it by having the head fill in before the transformation was complete.” Lead technical director Aaron Borland rendered the invisibility effects as a gel-like volume that filled goblin geometry with keyframe controls. “We made texture maps for compositors so they could bring on different colors by hand. We wanted it to look like it was a lot of work for the goblins to become visible or invisible — so as they appeared we made them thrash around, as if the vibration itself was making them appear.”

Goblin interactions with leaves scattered through the sets required extensive digital enhancement. “We cut the base of the goblins’ feet with a grass and leaf shader that chopped off the bottom of their feet,” said Blair Clark. “It created the effect that their feet were being occluded by geometry and made them sink into the ground. Our 2D supervisor, Colin Epstein, worked very closely with our technical directors to work out which



Tippett Studio created a distinctive look for Redcap, leader of the goblins, dressing the character in the bedraggled uniform of a Revolutionary War soldier.



Mallory and her brothers take refuge on the rooftop of their home as the goblin army surrounds them. The production filmed performers on a rooftop set, on location in Canada. ILM provided a digital environment, enhancing the elevated angle with house and forest extensions. Tippett Studio then employed its custom swarm technology to replicate goblins pouring from the forest and hopping about in an agitated fashion.

interactions we'd render as effects animation and how many breakout layers the TDs would supply to compositors."

Phil Tippett sent bags of leaves from set to his Berkeley studio as reference for texture artists and effects animators. Interactive digital ground cover was then rendered in layers with combinations of procedural dynamics and keyframe animation. "We had 97 shots with leaf interaction on the ground," said Russell Darling. "With that number of shots, we had to develop a quick system that we could use to generate leaf action. We rendered leaves in four layers: a wet lower layer that didn't move much, and different paint jobs for middle and upper layers that could be kicked around. We made it pretty automated, so characters could walk around and leaves would interact. Effects artists controlled how leaves spun in the air, floated down and piled up." To blend CG leaves into plates, compositors revealed synthetic leaves in characters' wakes and varied compositing techniques shot by shot, intermingling 2D elements of leaves shot on the Tippett Studio stage.



*Jared uses an enchanted stone eyepiece to view a hobgoblin named Hogsqueal. Tippett Studio created the digital character as a rascally porcine rogue, combining nature reference of bats and a potbellied pig to capture the spirit of Tony DiTerlizzi's illustration without making the creature appear too sinister or devilish. Hogsqueal's performance focused on the character's oral fixation, his obsession with procuring his next meal and general gross-out humor. Animators studied voice performer Seth Rogan's hand gestures from video shot at the recording sessions, and for broader pantomime studied John Belushi's slapstick antics in *Animal House*.*

In one of the most interactive sequences, goblins attack the twins' sister, Mallory (Sarah Bolger), who wards off invisible attackers with a fencing sword. The filmmakers shot the sequence on location in Cap-Saint-Jacques, drawing on months of goblin motion studies and the imaginations of the young performers. "We used our life-size character maquettes to create a sense of the real creatures on set," explained Phil Tippett. "And then we had our foamcore cutout goblins to move around and find the frame. I worked very closely with the stunt coordinator to develop choreography, getting very specific with beats and timing. We laid out a north-east-south-west clock configuration so we could direct Sarah to target specific zones at specific times."

Tippett kept track of goblin performances using colored and numbered markers on five key goblins to track positions through the fight, and timed Bolger's sword blows to goblin motion diagnostics. "Once we knew how fast a goblin walked, ran and galloped," Tippett explained, "that enabled us to not only direct Sarah, but direct the camera operators. Editorial technology allows us to speed up or slow down footage, but this was limited if ever we had a strong wind blowing, or human actors in the scene." Tippett, members of the special effects team, Tom Peitzman and occasionally producer Larry Franco wielded goblin cutouts at slow speeds to familiarize Bolger with goblin placement, and then gradually ramped up the pace. "We shot the rehearsal and continued making adjustments with our on-set maquettes. Then we pulled those out and Mark worked opposite Sarah, working faster and faster until he got the shot."

In defeating her attackers, Mallory wounds Redcap, a goblin leader dressed in the bedraggled uniform of a Revolutionary War soldier. “We had some extreme closeups of Redcap and wanted to add some interest to his character,” remarked Blair Clark. “Phil and I were big fans of the movie *The Vikings*, in which Kirk Douglas had a facial scar and a white scleral contact lens that turned him into a fearsome creature; and so we decided during the sword fight Mallory should wound Redcap by slashing him across the face, and from then on he had a scar going through his eye. It was an intriguing visual that made Redcap something more than a secondary throwaway guy.”

Goblins swarm around the Spiderwick house, seen from a high angle as the Grace children peer from the roof into a sea of creatures. The production shot the high angle on location with the children on a portion of the rooftop. ILM enhanced the plate with

house and forest extensions built from digital surveys of the location, allowing the camera to pull back further than initially shot. Tippet Studio then used custom swarm technology, *Riot Control*, to create 250 goblins from keyframe motion cycles. “We animated a bunch of goblins without weapons,” observed Todd Labonte. “We gave them run cycles, walk and transition cycles, milling-around-the-house ambient cycles, getting-into-an-argument-with-a-guy-near-you cycles. And then our effects guys applied scripts to make a huge field of particles that drove the cycles. We mixed in a bunch of bull-goblins, standard goblins and our core guys — there were probably about 30 ‘Tinys’ in that shot!”

The Grace children find an ally in the hobgoblin Hogsqueal, whom Jared rescues from a cage at the goblin camp. To film the campsite scene, Louis Craig’s team provided interactive motions of an empty cage on set, responding to playback of Seth Rogan’s voice and animation cues. “We had to articulate the performance of Hogsqueal’s cage to interact with his dialogue,” noted Phil Tippet. “Mark wanted multiple takes from different angles, so I worked out a way with Mario Dumont and his guys to puppeteer the cage based on punctuation of Hogsqueal’s line delivery, maintaining continuity in the motion of the cage. They tugged the cage on a wire and kept it ebbing; and whenever there was a certain syllabic block, we gave the cage an accent that we knew we’d use as an emphatic move on Hogsqueal. It’s sometimes difficult to communicate that very simple detail when you are shooting a scene for an animated character, but that can cinch the reality of a scene.”

Hogsqueal’s personality took shape in post-production, evolving as his scenes were reshot to accommodate new character ideas. “It was not problematic for us,” Tippet remarked. “We just pushed his animation toward the end of our schedule. One of the things I try to be conscious of is that animators, like actors, get mad if you make them do 800 takes! Ideally, we take a performance



A giant land troll pursues Jared and Mallory Grace as they attempt to escape the besieged Spiderwick Estate through an underground tunnel. In keeping with the screenplay’s description of the troll as a water-dweller, Tippet Studio sculpted it first in maquette form as a reptilian swamp creature festooned with moss. When logistical constraints narrowed the action to a ground attack, the Tippet creature team adapted the design to incorporate craggy rock-like growths, moss and twisted tree roots. On set, the production used an 11-foot-long foamcore cutout to guide actor and camera placements.

to the point where we're capturing lightning in a bottle and get it on the first take. It doesn't always work that way, but it's the best way to preserve spontaneity in a performance."

Seth Rogan's voice track, which brought Hogsqueal's character into focus, was combined with contributions from sound designer Mark A. Mangini. "There are two things for me that are most important in establishing character," stated Tippet. "One is the walk. Once you get that down, everything branches out from there. The other is the voice. In this film, we had a great deal of dialogue with lip-sync, which is always labor intensive. But even for our goblin characters, it was important that they weren't just doing 'lip-flap.' We wanted their voices to have a sense of attack and decay. So Mark Mangini used his library of animal sounds to create creature voices, and that was very helpful for our animators. For our leads, Mark and I spent quite a bit of time conceptualizing methods to help Seth Rogan and Martin Short as they were imagining their characters. Mark came up with quite a bit of animal reference, and encouraged Seth and Martin to parenthetically inject little snuffles or grunts so those could be blended in with animal sounds to help 'animalize' Thimbletack and Hogsqueal."

Jason Armstrong led the animation of Hogsqueal, emphasizing the character's oral fixation and gross-out humor. "Everything about Hoggy was drawn to the mouth and his huge bat nose," noted Todd Labonte. "That was obvious from the maquette, and it naturally came out of his scripted behavior, so we made that a signature for his character. His hands were always up in his mouth and nose. We worked a lot of nose picking into the sequences and gave him a lot of 'mouthy' things to do. That especially manifested itself whenever Hoggy was uncomfortable: he covered his face with his hands. We picked up on some of Seth Rogan's hand gestures from video of his voice recordings, but for the broader pantomime we studied John Belushi in movies like *Animal House*, with very bold, blocky moves, crazy and wild."

Tippet Studio shared scenes in the goblin camp with ILM for shots where the ogre Mulgarath appears, rising out of a pile of leaves and vegetation, and then transforms from human form into a cloven-hoofed ogre glimpsed from the legs down. To establish Mulgarath's identity through the transformation, Nick Nolte wore scleral contact lenses with a satanic yellow goat's eye design. ILM and Tippet Studio incorporated the eye design into digital renditions of the character, seen as Mulgarath takes the form of a large flapping crow that threatens the Grace children at several points in the film. "We initially built the crow as a digital stunt double for use in wider shots," stated Tippet. "That turned into a character that we got right up onto his eyes, using the same eye that ILM built for their ogre character. There's a real crow in the prologue of the film; but in nearly all the other shots, it's a digital crow."



In the garden of a nearby sanitarium, where their great aunt Lucy resides, Jared and Mallory witness a host of sprites – tiny colorful creatures that float out from a flowerbox. ILM designed multiple varieties of sprites after extensive look-development inspired by Tony DiTerlizzi's artwork and nature reference of exotic swamp orchids. The viewpoint team then translated those designs into delicate textures rendered with translucency. Animators used motion cycles to convey lighter-than-air means of

The Grace children try to evade Mulgarath's goblin army by seeking help outside the Spiderwick Estate via a secret tunnel. Inside the tunnel, they run into a giant troll. The troll was originally scripted as a water-based creature, which Tippett Studio sculpted in maquette form as a reptilian swamp being, festooned with dangling moss. Logistical considerations streamlined action to a ground-based attack, and the creature team adapted its design into an earthier lizard quadruped. "Tony originally designed the troll as very craggy, with a nose like a tree root," recalled Tippett. "We riffed off of that with a camouflage motif. In fact, at one point we had a scene where Redcap said, 'Go get the troll,' and the goblins ran off with their sticks, started pounding the ground and the troll erupted out of the earth. That scene was cut, but we retained the idea of making the troll look like it lived underground, caked with soil and moss, with grass and roots growing off it."

locomotion, with gentle undulations reminiscent of jellyfish.

Troll textures incorporated craggy outgrowths of rock, wood and moss encrusting the beast's powerful frame. "We had to decide if the troll was covered in real rocks and grass, or if its body was mimicking nature," observed Joel Friesch. "We went with the latter: scales mimicking rocks, hair mimicking grass. We modeled rocks and constrained them to his skin so they stayed put while everything moved around them. We created moss as 2D displacements and grew grass using our in-house fur tool with new parameters to make hairs look like blades of grass. Our effects animators then made that flow like a field of grass."

Mark Waters filmed the troll attack with Freddie Highmore and Sarah Bolger interacting with a foamcore cutout of the 11-foot-long creature. To simulate the creature breaking into the tunnel and latching hold of Jared, effects technicians staged cave-ins of mud and wire-pull gags with a young stunt performer. LED tracking markers provided Tippett matchmove artists with geometry of the set, allowing animators to situate the troll with digital enhancements of roots that reinforce creature impacts with the tunnel walls.

The children escape the troll by emerging through a manhole in a street — which a pickup truck drives over, breaking the creature's neck. The production filmed the scene with a stunt driver screeching to a halt in a village street in Quebec. Tippett Studio added the creature and a gooey aftermath of thick green troll blood, tracked into place over the pickup's fender.

In the village, Jared and Mallory visit their great aunt Lucy (Joan Plowright) in a sanitarium and, while revealing their knowledge of Lucy's father's research, they are confronted by a host of sprites — tiny magical creatures that float out from a flowerbox where they have been camouflaged among



Seeking to locate long-lost Arthur Spiderwick, author of a magical field guide to the fairy world, Jared, Simon and Mallory summon a griffin to transport them from the Spiderwick Estate. ILM generated the griffin as a half-lion/half-eagle chimera with powerful wings and a quadrupedal gait. Animators used a rapid-prototype model to establish beats of the performance as a template for a bluescreen shoot in which the young actors rode a gray-colored griffin motion base. Closeups featured the actors, while long shots employed digital doubles, composited onto a CG griffin textured with complex fur and feather grooms.

the blooms. Pablo Helman filmed the scene using small cardboard models of the creatures on wires to guide eye-lines and compositions.

ILM designed multiple varieties of sprites after extensive look development inspired by Tony DiTerlizzi's artwork. "The flower sprite was designed from a real flower," revealed Christian Alzmann. "We found a photograph of a swamp orchid from Florida that appeared to have a head and feet and arms. It looked like a really big, lush, beautiful flower so we tried ordering one via the Internet and, unfortunately, it arrived dead and it was only about an inch and a half across — but it was very useful for our design." Viewpaint lead Jean Bolte and her team developed flower sprites, insect-like 'humming sprites' and 'water sprites' using delicate painting techniques and translucency effects to convey the softness and elegance of flower petals.

Tim Harrington's animation team devised sprite motion cycles to convey a lighter-than air means of locomotion. "Fairy creatures traditionally have insect wings and it's pretty easy to figure out how they fly," said Harrington. "These sprites didn't have any wings, but each had one big petal. We came up with an idea that the little creatures could each use their petal as a glider, pushing themselves through the air like jellyfish and undulating as they were carried on the wind. We worked out four or five key poses and cycled those to create fluttering motions. Facial animation was very subtle, just eye-blinks, a slight smile, eyebrows up and down, as sprites reacted to the humans. Jason Smith's group then did simulations on the petals to create effects of ambient wind and turbulence."

The Grace children later encounter a more sinister breed of tiny airborne magical creatures in an enchanted fairy glade where a flock of sylphs, resembling fluffy dandelion seeds with elfin faces, swarm about and hold Arthur Spiderwick (David Strathairn) in their thrall. "We imagined sylphs to be like a flock of whirling dervish dancers," said Christian Alzmann. "I designed individual characters and concept paintings of the cloud with a shimmery pearlescence. That went hand-in-hand with a lot of work from our effects animation team."

Tim Harrington's team generated closeup shots of sylphs as keyframe animation. Shots with thousands of the creatures used dense particle simulations. "We stored archived cycles of sylph animation onto disc," explained Michael Bauer. "Then, at render time, we replaced the particles with the sylph animation. We had different levels of sylph complexity depending on how small the sylphs appeared. We blended crowd sylphs with hero sylphs in scenes requiring both." Digital artist Raul Essig developed a modular particle simulation pipeline for sylph behavior, allowing effects animators to control the cloud dynamically and target sylph behavior. "The system employed follow-curves as well as a tracked magnet approach to influence and fine-tune particle behavior. We could create rotating internal movements within the swarm by manipulating multiple curves, and we could also attract the swarm to proxy geometry, such as when the sylphs swarm around Arthur Spiderwick. It enabled effects animators to set up scenes very quickly so they could devote more time to capturing the feel of how the sylphs would move."

To reach Spiderwick in the glade, Jared uses his field guide to summon a half-lion/half-eagle griffin whose physiology — four legs, a tail and two wings — made the creature among the most complicated to animate. "The griffin had to fly," noted Harrington, "and he had to walk on all fours, with live-action performers on his back. He also had fur and feathers, which was quite a technical challenge." The ILM animation team rapid-prototyped a griffin model to work out the creature's

stately gait and muscular flying poses. The animation became a template for a Los Angeles bluescreen shoot with performers riding on a gray-colored motion base representing the griffin's back. ILM also shot performers as reference for building digital doubles of the children used for wider shots of the creature soaring above the Spiderwick estate.

To develop the digital griffin model, ILM gathered video nature reference of a red-tailed hawk at an animal sanctuary in San Rafael. Look development supervisor Kevin Reuter then extrapolated colorations and developed interactions of fur and feather grooms. "Kevin identified feathers on the griffin using area maps along the creature," explained Michael Bauer. "The feathers were more pointy on top of his head, softer on the chest and more rounded along the creature's back and wings. The area maps drove what type of feathers we applied. We output guide splines as meshes, then rendered those with different feather patterns that Jean Bolte painted in Viewpaint. Other splines we rendered as hairs and created mixtures of feathers and hair across the creature's body."

The flight to the glade began with a location shoot using a façade of the Spiderwick house shot on location at the Los Angeles Arboretum. ILM digitally extended the forest, distant hills and house, and covered residential buildings revealed beyond the natural tree line.

Compositors integrated live-action elements of the Grace children onto closeups of the griffin. "We buried Freddie's hands into the feathers by rendering a little patch of feathers layered in as a matte to cut the hands," explained Tim Alexander. "For a closeup of Freddie gripping the feathers, Kerner Optical built a section of the griffin back, which we filmed as an insert shoot." Shots of the griffin in flight incorporated aerial photography filmed over northern New York State and ILM synthetic environments. "Once we got up into the clouds we entered a full CG environment created by our digimatte supervisor Brett Northcutt and his department using elements projected onto 2D cards. When the griffin dove down into clouds, our digimatte artist, Paul Huston, went onto our motion capture stage and built and lit a big fiberfill cloud environment which he shot as textures. We used hundreds of texture cards to create the volume and the look we needed, but it was a much simpler approach than rendering volumetric clouds — and I think it got better results."

To emphasize the transition from the real world to the fairy glade, ILM designed the griffin flight to reflect a magical passage of time. "We were flying from the forest in the fall to the spring-like glade," noted Christian Alzmann, "so we thought maybe we could have them fly through the seasons. It was a subliminal effect, but it was fun to attempt, and we gave each world its own distinct view." After diving through golden autumnal clouds, the griffin approaches a giant wall of ice. Brett Northcutt's team generated the ice cliff as a digital matte painting enhanced with photographic textures accumulated during ILM's work on the Antarctic drama, *Eight Below*. As the griffin flew into a crevasse in the ice wall, Northcutt's team generated 3D geometry using Pixologic ZBrush rendered with



The griffin deposits the Grace children in a magical glade where they find Arthur Spiderwick (David Strathairn), unaged since his disappearance 80 years earlier. To emphasize the transition from the real world into the fairy glade, ILM designed the griffin flight through aerial environments representing the four seasons. The ILM digimatte department created backgrounds for the flight employing aerial photography, miniature cloud elements and matte paintings enhanced with photographic textures. For scenes in the glade, ILM extended a digital cyclorama

scatter, reflection and refraction enhanced by painted and photographic textures. For shots of the griffin swooping down into the glade, shot in the L.A. Arboretum, Northcutt ringed the oasis of greenery with a digital cyclorama of ice cliffs projected and composited behind plates.

For the finale of the film, the Grace children enlist their mother's aid to defend the Spiderwick home against goblin attack armed with salt, vinegar and tomato sauce. Tippett Studio generated dozens of invading goblins as keyframe animation handled by the 28-person animation team. "We had about 30 house siege shots," said Todd Labonte. "If we'd had many more we'd probably have spent time animating a ton of different cycles to populate the scenes. The sequence fell between having too many goblins to do it all by hand and not having enough goblins to make it worth doing procedurally, so we animated everything by hand. We split our busiest shots between animators, with the first animator blocking out a scene to determine goblin quantities and timings. Then we divided up the rest of the work, and said: 'Roll up your sleeves, boys. We're going in!'"

Special effects teams choreographed on-set goblin interactions to simulate goblins breaking their way into the house. "Mario's guys came up with a complicated rig to burst through the floorboards," recalled Phil Tippett. "For goblins breaking through the ceiling, they used big shovels that they loaded with plaster out of shot, and on cue all the plaster would fall down. We augmented that later with goblins breaking through the ceiling and other elements." For multiple character interactions, effects teams occasionally improvised effects. "A lot of gags required specific rigs that we knew we were going to need, so we had things standing by; but Mario's and Don's guys were good at making stuff up on the fly. We'd say: 'Wouldn't it be great if a goblin fell and hit the table and knocked it over here? Okay, let's do that!' While they were wiring up the table, we'd say: 'Let's have another goblin fall and jump onto the chair and jump onto the couch. How are we going to do that?' And one of Mario's guys would dress up in black and throw in a sandbag on the couch. When the goblins in the ceiling grab hold of Jared's hand, Mario dressed up in his black Ninja outfit and used a grabbing device to grab Freddie. We rehearsed it until they hit their marks, and then later shot a clean background plate and used that to paint Mario out."

Simon's homemade tomato sauce grenades and vinegar spray bottles cause goblin flesh to sizzle and burn. Tippett Studio shot practical goblin burn tests as reference — dissolving styrofoam with

of ice cliffs composited behind plates of the actors filmed in the Los Angeles Arboretum. The scene, in which the griffin swoops down into the glade, shot in the L.A. Arboretum, Northcutt ringed the oasis of greenery with a digital cyclorama of ice cliffs projected and composited behind plates. The sequence fell between having too many goblins to do it all by hand and not having enough goblins to make it worth doing procedurally, so we animated everything by hand. We split our busiest shots between animators, with the first animator blocking out a scene to determine goblin quantities and timings. Then we divided up the rest of the work, and said: 'Roll up your sleeves, boys. We're going in!'"



The goblins' overlord, the shape-shifting ogre Mulgarath, reveals his true form during the attack on the house, rising up through the floorboards and filling the living room as an immense satanic beast. ILM designed the character via a clay maquette and then used Photoshop renderings to depict progressive stages of Mulgarath's transformation to full ogre size. The creature team mapped human skeletal and muscle anatomy onto the larger humanoid creature body to simulate muscles and skin sliding on top of muscles, and textured surfaces with earthy details, wetness and reflections from light sources on set.

solvents and melting animal fat under a heat gun — and then developed shaders to emulate searing effects on goblin flesh. “The shader caused goblin skin surfaces to displace inward with procedural bubbling,” said Joel Friesch. “As it shriveled, it also bubbled like bacon grease and revealed bones that we added inside. We ran that through different channels so compositors could control colors, turning skin to a sickly green, then black, as it fried.”

Goblins also fall prey to death by kitchen knife, which required careful animation to earn the film its desired PG rating. “The shots of Jared using a butcher knife to chop off goblin hands punching through the floorboards were in and out of the movie half a dozen times,” recalled Todd Labonte. “Dismemberments, where body parts are separated from the body, are apparently a red flag. If they are not human and the blood isn’t red, it’s easier for the MPAA to accept. It felt like we were creating *Starship Troopers* for kids — which was terrible, but fun! If we make just one child cry, it will all have been worth it.”



Arthur Spiderwick returns to his former home, transported by a cloud of sylphs, and is reunited with his aged daughter, Lucy, who reverts to the child she was when she last saw him. David Strathairn performed the scene wearing special shoes that elevated him a few inches above the set. ILM digitally painted out the shoes and animated a floating carpet of sylphs below.

In a gory and comedic Grand Guignol finale, Redcap and his minions waddle into the kitchen, intrigued by a trail of flame that leads to the oven and then detonates an explosion of tomato sauce, turning goblins into mulch. Louis Craig's team staged the explosion on set at full scale, using real tomato sauce. "They had big compressors behind the set and tons of tomato sauce!" recalled Phil Tippett. "They did a lot of testing outside in the parking lot, and continued to work on the arc of the spray until they got it working right. It was one of those situations where we really wanted to do it only once, so rehearsal was essential. We were on pins and needles, because the big problem with tomato sauce was that it wasn't just going to blow up, it was going to mean a huge cleanup. Fortunately, it worked perfectly the first time — but it went everywhere. While shooting the subsequent shots, we had to work in that room with decaying tomato sauce, which made everybody retch."



A sentimental Thimbletack becomes teary-eyed at the reunion and departure of his old friends.

Tippett Studio integrated goblins into the explosion by creating blend shapes of dissolving goblins composited with 2D smoke elements. "We generated our own digital tomato explosion element to blend characters with the practical effect," explained Russell Darling. "We rendered different layers of juice so we could have our lower layer, put the goblin in and then coat him with an upper layer as he melted into a steaming puddle."

During the invasion, Mulgarath — revealed at last in his giant ogre form — attacks, punching up through floorboards and tossing aside a carpet and a grand piano. Physical effects stripped down a piano prop and rigged the instrument to fly across the room as actors reacted to eye-line guides. "We used a nine-foot-tall cutout of Mulgarath on set," said Pablo Helman. "Mark would speak through the take, relaying the narrative, which was a great way to get everybody acting and reacting. We rehearsed all of the action cues verbally — on 'one,' the door exploded; at 'two,' the table went over — and then, on 'action' we called out the numbers and everyone followed through."

To create the animated character of Mulgarath, ILM sculptor Carlos Huante first sculpted a clay maquette, incorporating design features of a satanic bipedal warthog with oversized canines, protuberant jaw and horny outgrowths down the creature's back. Huante used digital photographs of the maquette to develop Photoshop renderings as concepts for the creature's transformation, bulking out to full ogre size. "We rigged Mulgarath by remapping a human skeletal and muscle anatomy onto his larger humanoid creature body," explained Tim Harrington. "We used that to create a rapid-prototype model of Mulgarath before the final design. We also used it to map a skeleton and muscle system into the creature to simulate muscles and his skin sliding around on top of the muscles."

Animator Stephen Aplin led keyframe animation of Mulgarath's performance, referencing video footage of Nick Nolte's ferocious vocal delivery, and took cues from physical interactions in the

plate. ILM replaced a practical element of the carpet rising, generated a cloth simulation of carpet to interact with the ogre, and animated dynamic simulations of flying wood fragments to enhance creature impacts with the set.

After Mulgarath's first attack, the beast returns disguised as Jared's father, Richard (Andrew McCarthy), who then erupts into ogre form. "We had to make sure the Richard geometry matched Mulgarath," said Michael Bauer. "We built the two characters from the same mesh, added Mulgarath's back spikes onto the Richard geometry, squashed in the spikes and pulled them out through the transformation. It was tricky because we were going from Richard in the plate to Richard's geometry with plate projection, and combining that with a painted version of the actor's model and another model of Mulgarath. Our CG supervisor and lead artist on the shot, Leonard Estebecorena, had to do a lot of work to get all those elements to work together in a seamless fashion, using creative transitions, making sure the models were compatible and matched to the plate."

Mulgarath chases Jared up through the house, transforming into a large snake and then back into an ogre for a confrontation on the roof. ILM used shared-mesh transformation techniques to change Mulgarath into a snake, shaping geometry and transitioning between textures and looks. Mark Waters filmed the rooftop fight on a bluescreen set in Montreal. ILM generated a 360-degree digital cyclorama of a nighttime forest background to surround the set, and added interactive ivy and breaking shingles. "We first worked out where Mulgarath was going to place his hands to tangle with the ivy and break off parts of the roof," said Tim Alexander. "Kerner Optical then rebuilt those parts of the set and we had a practical element shoot to create those specific interactions."

At the conclusion of Jared's fight with Mulgarath, the ogre falls from the roof, transforms into raven form and becomes a meal for Hogsqueal. ILM and Tippett Studio combined forces for the scene, ILM animating three shots of Mulgarath transforming into the raven before Tippett Studio took over for the scene's conclusion. "We had 14 shared shots with ILM," stated Russell Darling. "ILM and Tippett Studio had characters directly interacting with each other, sometimes in the same plate, so it was important that we were both working in a neutral color space. That way, whenever we exchanged images there was no need for color correction. Both studios split the comps, depending on whose character was the main focus of the shot. It was one of the big successes of this project."

After Mulgarath is vanquished, Arthur Spiderwick returns to the Spiderwick Estate on a cloud of sylphs. David Strathairn performed the scene walking on specially fabricated shoes that elevated him above the set. "David had gigantic six-inch risers on his shoes, like a geisha," related Tim Alexander. "We painted out the shoes, digi-tally reconstructed portions of his feet and then animated a bed of sylphs below him. To make him appear to float as he stepped on the sylphs, we split the actor from the plate, warped his legs a little and made the sylphs poof up slightly as his feet touched down."

Joan Plowright performed Lucy's reaction to her father's return, taking Spiderwick's hand. In a closeup of their interlocking hands, the woman reverts to her child persona. ILM Saber artist Daniel O'Brien generated the transformation as a morph in Inferno. "Dan did some interesting things to reinforce the idea that Lucy was getting smaller," said Alexander. "He made Lucy's sleeve appear to move up her arm as the little girl took shape. He also lowered the relative position of the hands in

frame as Lucy turned into the little girl. It was a really long shot with an editorial re-time on top of the morph to slow it down even more; but the morph was done so well, there were no re-time artifacts.”

The elegiac scene concluded a film that strove to maintain a balance of broad humor, intense action and fantasy without bogging down in a surfeit of visual effects. “There was so much in our film that we were adding later,” noted Tom Peitzman, “it was quite a challenge to keep it real on set for our young performers. But the way we used the tools — setting up the scenes with previz, storyboards and physical maquettes — all helped ground the story in reality, instead of it degenerating into a bunch of CG characters running amuck. I think, ultimately, that is how we were able to make the story come alive up there on the screen and make this a very photorealistic, organic-looking film.”

The challenge fell to visual effects to strike an appropriate tone, producing a credible fantasy world for a demanding contemporary young audience while maintaining the book’s whimsical worldview of a hidden supernatural realm. “What attracted me to the subject matter,” reflected Phil Tippett, “was that it was an intimate story about this family. It wasn’t trying to bonk you over the head with spectacle. It allowed us to play fanciful characters in a Bruno Bettelheim kind of way — as fairytale extensions of the kids’ unconscious selves. To find those characters, I visualized a dial that went from ‘silly’ to ‘evil.’ My job was to modulate where on that dial we landed for each particular scene.”

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